

**THE JOURNAL OF THE  
NATIONAL SMOKE ABATEMENT SOCIETY**











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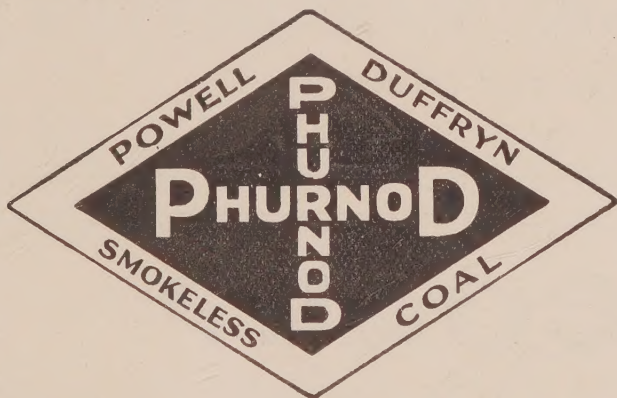
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# The Journal of the National Smoke Abatement Society

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*The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgements are made.*

## Domestic Smoke Legislation.

WHILE legislation concerning industrial smoke, and its associated administrative problems, is still an uncompleted task, the most difficult legislative work of the future will be, it is highly probable, action with respect to smoke emitted from dwelling houses.

The possibility of legislation which would either prohibit or tend to reduce domestic smoke has often been discussed, but because there have never been any immediate prospects of practicable steps being taken, no definite expression of opinion has ever been formulated.

It will be agreed, however, that unless propaganda can be made so effective that a radical change in the mass of public opinion can be achieved there must come a time when domestic

smoke will have to be tackled as most other reforms have been tackled : by direct legislation. Certain conditions will have to be assured before any demand of this nature can successfully be expressed, and, although these conditions are at present far from realization, unexpected developments at any time may bring them about within a relatively short period.

The fundamental proposition is that at present the great majority of the houses in this country are heated by raw coal used in open fires and ranges. Even though gas and electricity and the solid smokeless fuels are being used in a rapidly increasing number of houses there is yet only an infinitesimal fraction where the use of coal has been *completely* abolished.



Legislation could be directed towards prohibiting the use of smoke-producing coal or, while still permitting its use, in some way penalizing the consumer. The former method would undoubtedly prove the more effective, but before it could be introduced there would have to be ample safeguards to ensure the supply of substitutes for coal which would perform the functions of coal in existing appliances and at no greater cost. Unless this was possible there would arise such an opposition that the chance of success for the Bill would be negligible. It would also be extremely difficult, if not quite impossible, to frame an enactment which would enable all coal using appliances to be replaced by new ones ; and while solid fuels which would conform to the standards that would be required do exist, and are being used to-day, it is obvious that their economic production could not be expanded in the way that would be required, even though, as would in all probability be the case in any circumstances, the Act would not come into operation for a period of years after being passed.

Legislation which would not prohibit the use of coal for domestic purposes, but which would by some kind of penalty discourage its use, is more immediately possible, although in this case too, considerable difficulties would have to be overcome before it could be accepted. The suggestion put forward by Sir Napier Shaw and Dr. J. S. Owens in their book appears to be on the most likely lines. This was that a reduction in rates, specifically on the cleansing rate, should be allowed to ratepayers in whose premises no smoke-producing coal is used. It has to be admitted that the adoption of even such a com-

promising measure as this could not be achieved except by persistent endeavour for some, perhaps many, years.

Arising out of these considerations are a number of questions. As obviously nothing can be done immediately there has been no general desire to discuss the question, and the point arises whether it is preferable to leave it entirely in abeyance until circumstances render some measure practicable, or whether it would not be of value to look upon it as a living problem, and, by subjecting it to discussion and criticism, mould it into a definite and practicable policy? To do this would undoubtedly waken the public more than anything else has done. To hear the proposals for abolishing the coal fire being considered in detail, and to learn that sooner or later these proposals would be presented, in the form of a Bill, to Parliament, would bring about a sharp realization that the coal fire, after all, could not be the divine prerogative of the Englishman's home. Thus, even only as an instrument of propaganda, should the subject of domestic legislation find a place in our conferences? Or on the other hand, by being too precipitate, and too far in advance of public opinion, would it tend to create hostility to the smoke abatement movement? And again, even if there was such a danger, might not such hostility, in place of the more usual deadly apathy, be of real value in the long run?

The whole problem, of such immense potential importance and exceptional difficulty, is full of interest. We should be glad to have the comments of our readers upon the questions that are involved.

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HAVE YOU ORDERED YOUR "FUMIFUGIUM" YET?

(See announcement, page 11)



## An Outrageous Proposal

*Imagine that this country had never had a smoke nuisance because nothing but smokeless methods of heating had ever been used. This nation of clean white towns which sparkle in the bright sunshine is one day amazed to hear of a strange proposal. Here is a leading article from one of the imaginary newspapers of that idyllic land :*

Coal, the naturally-occurring chemical base from which so much wealth and power is obtained by distillation and hydrogenation, is the subject of a fantastic project by a group of people who do not seem to have realized the dangerous implications of their ill-advised proposals. It has been for long been known, more as a scientific curiosity than anything else, that coal will burn under certain conditions, much as a fuel will ; and the scheme, in brief, is that it should be sold to householders for burning in special containers or grates in the house for warming and heating purposes. In the interests of the nation we do not hesitate to say that this is the most deplorable conception that has ever been advanced in modern times, and which from every point of view must be unequivocally condemned.

It is indeed inconceivable that such a crude and barbaric use of this valuable raw material of the chemical industry would in any circumstances be permitted. One would as soon expect public sanction for using the books in the British Museum as fuel, even though they would probably burn quite as well, if not more easily, as this coal. Again, we understand that coal, if used in the wanton fashion that is suggested, would not be wholly consumed, but would require a chimney or flue to enable the gases and unburned particles to be carried to the outside air. The smoke emitted by coal when burned is, we are informed, both excessive in quantity and highly objectionable in character. It is easy to contemplate the consequences of a general use of the material in any town : there would be such an outpouring of smoke and harmful gases, such a Stygian gloom, such a rain of acids and dirt, that the catastrophic affair would, by urgent mutual consent, be halted almost as soon as it had begun.

Happily there are very strong personal reasons in addition to those of national concern which most assuredly will bring about the failure of the project. We have made some inquiries about the conditions

under which this coal would have to be used, which, we find, are so preposterous that we cannot imagine any rational person even giving the method a trial. To begin with, coal cannot be delivered along a pipe or a wire, but has to be purchased in bulk, either in large bags or even by the ton ! It would therefore require cellars reserving for its storage, or where there are no cellars, special outbuildings would have to be constructed to hold it. From its nature much would crumble into dust, and some would be in such large and awkward pieces that it would have to be broken by hammering : a most primitive and stupid labour.

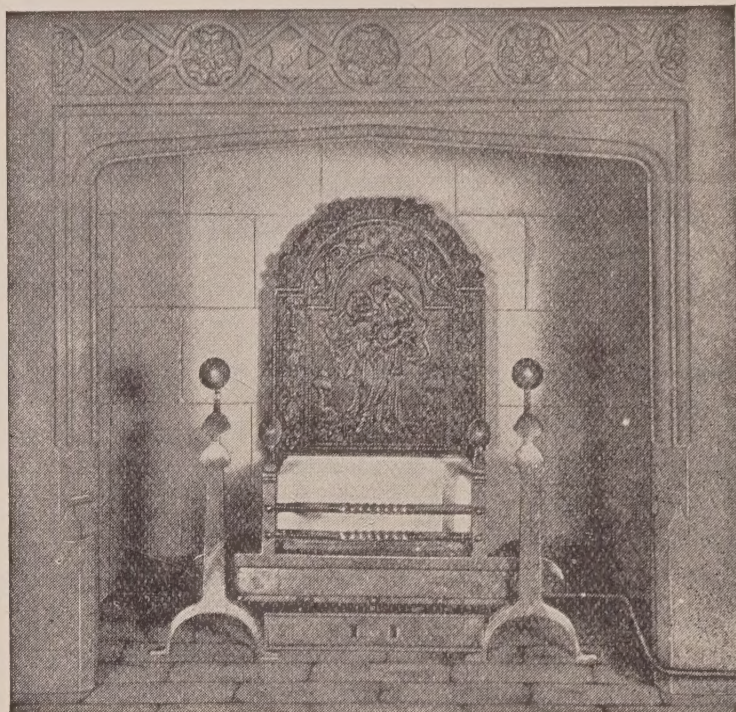
Then it would have to be brought into the rooms in buckets, and placed, by hand, in the grate. This would not have to be done just once, but continually, as the coal burned away. Nor will it, we understand, light instantly, but requires other substances to assist it. The promoters of the scheme amusingly suggest that it should be lit with sticks of wood, and that these, in their turn, would require to be lit by paper ! Further, coal soils the hands, and anything else it touches, and also, as the mineral ash it contains cannot be burned, the grate has to be emptied and cleaned each day before the next fire can be prepared. In addition to the smoke passing out through the chimney some of it will float out into the room, necessitating frequent cleaning and dusting, and much will lodge in, and tend to choke, the chimney passage. This is frankly admitted by the promoters of the scheme who are hoping—so optimistically—to popularize the method, and they point out that corps of men will be specially trained to clean or decarbonize the chimneys. One can imagine them at work among the bright fabrics and light furnishings of our homes !

The scheme, it will be agreed, would be merely absurd if what chance of success it might have were not so dangerous. We have authority for saying, however, that if it were to assume serious dimensions the Government, which is carefully watching the situation, would step in to take swift and prohibitive action. But we can depend upon the idea failing even before it has begun simply because to the British housewife it will seem stupid and incredibly dirty. It is not exaggeration to say that when the implications of the use of coal are explained to her, her innate sense of cleanliness and household pride will cause her to recoil in horror from the outrageous proposal.



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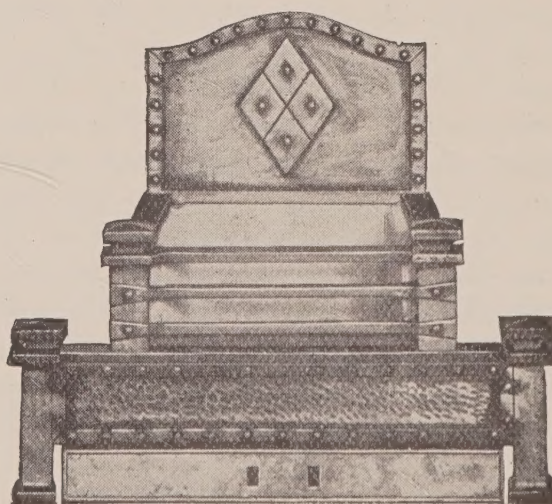
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# Smoke and Public Health.

*A Paper read by the President, H. A. Des Voeux, M.D., at the Society's Session of the Public Health Congress, on November 15th, 1932.*

How difficult it is to give a simple definition even of words which are in continual use. Here is one—"Health"; we speak of health daily, and of unhealthy people, but few of us can define exactly what we mean by such words. Health has been defined as a condition in which the person is unaware of any part of his or her body—only aware that he is alive and has no discomfort, but only a joyous sensation of wellbeing. But what of a plant—it may be healthy or unhealthy, and has no brains by which it can express its feelings. We have to judge for it by our eyes or our touch; yet it may die suddenly without any previous noticable signs of illness.

I find the following definition in Annandale's dictionary:—"Health is that state of an organized being in which the parts are sound, well organized and disposed, and in which all the organs perform freely their natural functions." This is an elaborate and very strict definition, and if we judge ourselves or our friends by such a standard, how few of us would be in Class 1. Anything below that standard would put us in Class 2: and I fear that most of the present generation belong to Class 2: and the aim of all those whose duty it is to raise the standard from 2 to 1 must be to fight apathy, ignorance, and opposition; to preach and go on preaching that no nation can be satisfied with its present standard, and must not rest until better things are attained.

The medical men are aware of the wretched conditions of health from which even infants, almost from birth, may suffer; such things as indigestion, nervousness, sleeplessness, and eczema being common; yet we are unable to say why, nor are we able to give a prognosis as to how long they will last, or how after-life will be affected. Within a year or two other manifestations of ill-health are even more common and their names are household words—enlarged tonsils, adenoids, and carious teeth. And in fact I think I can say without injustice that caries of the teeth (decayed teeth) is so universal that in no family is it expected that children should have strong teeth, but in the natural order of things they must pay regular visits to the dentist; and I am assured, and from my own experience can well believe, that early and regular attention by the dentist to young school children has added greatly to the general standard of health of schools.

When we come to adenoids and tonsils—are we in a different category of disease, or are all three related? Personally I believe they are related: and I cannot help thinking that the relation is through the improper

dieting in vogue at the present time. But the arguments about these are not the purpose of my address to-day, which is limited to the effect of smoke in the atmosphere upon health.

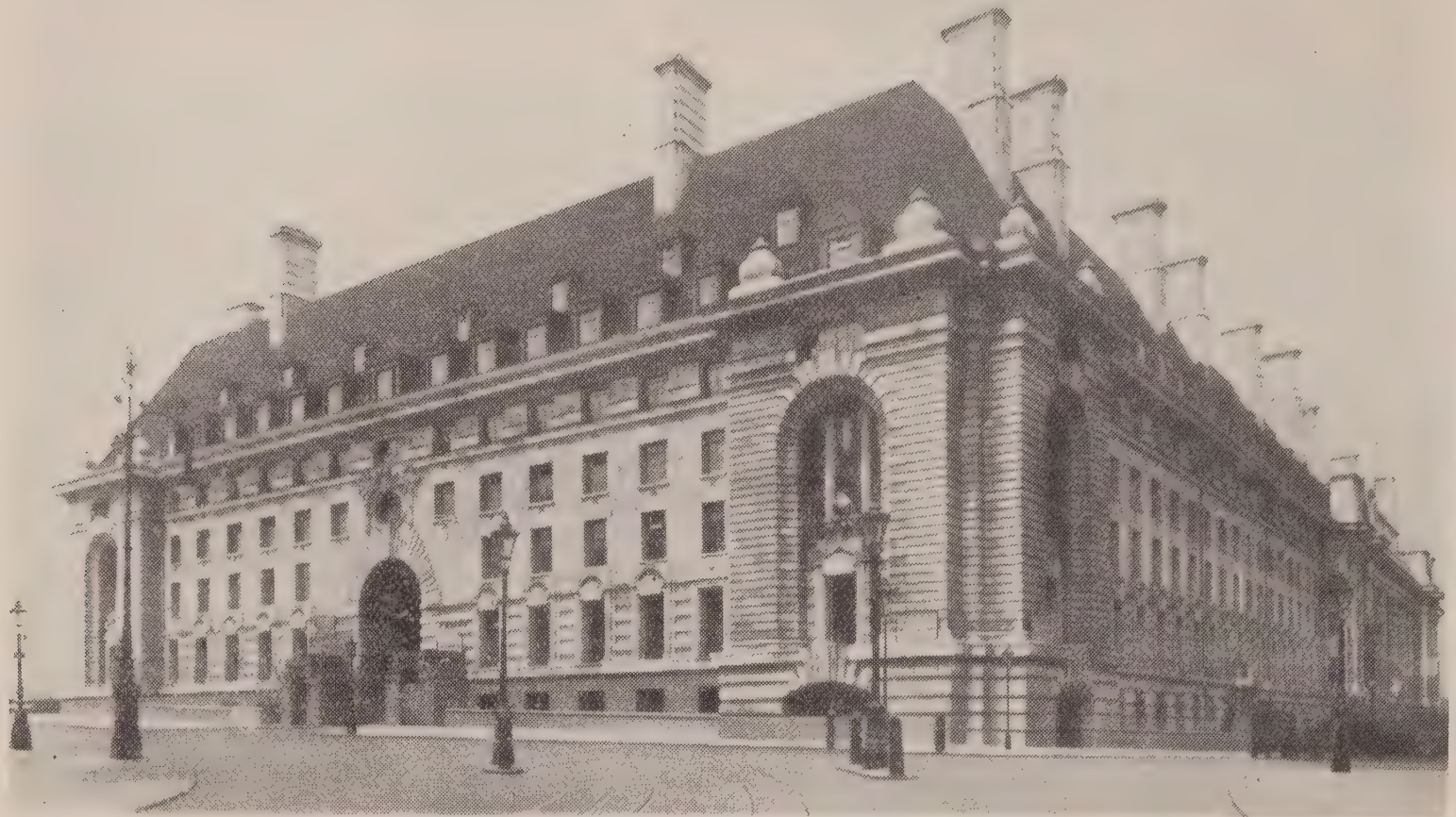
## Food, Water, and Air.

Now it is a curious thing that we are dependent upon three external sources of nourishment for our health—food, water, and air; and if any of you will take the trouble to read the first great book written upon Public Health by Sir John Simon, you will only find one half page at the conclusion upon the pollution of air as being a cause of ill-health. Food and water are discussed throughout, and it was through his investigations and influence that a great part of the wonderful work which has since been accomplished in the purification of these two essentials was brought about. It can now be said that you can eat as much food as you like and drink more water than you usually care to do, without fear of harmful effects. But great man as he was he never mentioned that simple fact that although you are well nourished if you take five pounds of food and drink per day, you must have 35 lbs. by weight of air in the same time in order to supply your blood with oxygen—roughly speaking you can live three minutes without air, three days without water, and three weeks without food. This is the order of necessity, but how many of you care whether the air is pure or not, or how many town dwellers cast one thought as to whether the impure air which they breathe 16 times every minute is having a bad effect upon them. Of course it is obvious that the reason for this thoughtlessness lies in the two facts that town dwellers have been born in dirty air and consider that its noxiousness is one of the concomitants of town life, and secondly that the effects upon their health are not immediate and severe, but are chronic and evasive except during times of dense fog.

The dirty atmosphere of large cities, especially industrial ones, is due to the combustion of bituminous coal, both in factories and domestic grates. In both these cases it is employed for the purpose of creating heat, and if the coal could be completely burned the blackness of the air could be avoided—but the impossibility of complete combustion (most marked in the domestic fireplace) allows some part of the carbon and hydrocarbons to come away from the chimney in the form of our dirty black friend—the soot, which is formed of carbon and tar, and is always impregnated with sulphur. But even with complete combustion there will always be thrown into the air a considerable amount of sulphur in the form of sulphurous acids; and it is these two substances, sulphur and tar, which have a deleterious effect upon health.



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Both are irritating, and both during the act of respiration are breathed into the depths of the lungs, passing over the delicate mucous membrane of the nose and throat on their way. The slight but continuous irritation which they produce causes a compensatory action on the part of the mucous membrane, a congestion (flushing of blood) and consequently a discharge of mucous from the glands, and the well-known catarrh appears—"cold in the head," "running of the nose," etc. This is the first stage in the production of chronic bronchitis, which may follow in its train.

Sometimes soon, sometimes not for many years, the result depending upon the susceptibility of the individual and his powers of resistance, years of this produce chronic ill-health, repeated illnesses, and finally, from continual overstrain, disease of the heart and death. When you consider that the statistics of death tell you over 10% of the deaths in this country are due to respiratory diseases, and that the rate in country districts is about half what it is in big cities, it may set you wondering whether your apathy with regard to the tar and sulphur in city air is justified.

Most of you must have some relation or friend who has been a sufferer from, first of all recurrent bronchitis, and finally chronic bronchitis—you have seen the misery and suffering produced by it; but have you ever considered that polluted air is certainly a common, possibly the commonest, cause of this terrible disease?

The indictment of a smoky air for so many reasons is so strong that I have always been anxious not to exaggerate the evil it causes in any one particular, but statistics point out strongly to the inference that if we could enjoy as clean an atmosphere in our cities as we do in country districts, a great diminution of the death rate from respiratory diseases would follow, and an enormous diminution in the sickness rate.

I am not going to claim any other set of diseases as being directly due to smoke, but there are other aspects of the matter which demand our attention. Since time immemorial the sun has been recognized as the source of all life, in plant and animal alike, and we are all aware that healthy growth, vitality, and strength, depend entirely upon the rays which it sends to this planet of ours—and there are many different rays, some give light, others give heat: of both of which we have common knowledge, and for which we ought to render more thanks than we do. Others—the invisible ones—have powers of which we are only lately cognisant, but which are vitally important to us through their influence on growth. These rays are given us for our use and to give us health; and what has our boasted modern civilization done for them?—thrown a thin impervious blanket between us and them in the summer, and a thick one in the winter, just as we do to keep out the cold. But the smoke

blanket is a dirty, noxious, smelly thing, which can never have attention from the laundress as our woollen one can, but which can only be cleaned by being blown completely away by the wind (only to be renewed again and again). But before this it has let fall thousands of millions of dirty particles, on and in houses (if the housewife is plucky enough to open windows); on stonework and statues; on street pavements and in gardens; destructive of all it touches, from the King in his palace to the tenement owner in a back street. We are all aware of it, but do we know that at its worst it has complete power of "blanketting" the sun's rays and preventing the town dweller from attaining that benefit to his health which the rays would give him, and at far smaller cost than even the smallest doctor's bill or the chemist's charge for a bottle of codliver oil?

### "Sunstint"

As a consequence of this, what do we find amongst the children who are brought up in this "sunstint"?—pallor, anaemia, stunting of growth, general want of vigour and health, and a large number of cases of that terrible disease, Rickets, or the "English disease," as it was known on the continent when first described. This disease is principally one of the bones—they are stunted in growth, are , and deprived of the lime and phosphorous, which are the essential salts of firm hard bone; and the damage done, unless checked in the very early stages, is permanent and leads to deformities which remain through life, generally cripple the sufferer, and sometimes cause death. Nothing is more capable of proof than that the principal cause of this is defect in the amount of substances known as Vitamins A and D—both of which can be produced not only by the action of the rays on the body, but by their action on the vegetables the children eat and the milk they drink: for cows fed on grass which is grown near big cities cannot produce these vitamins.

There is yet another side to the evil and distressing effects produced by a smoky atmosphere—I refer to the psychological side. Animals and birds sleep for the most part during the darkness, and are active and during the hours of light. Primitive man followed their example, but modern man has to work in both light and dark. But there is ample evidence that through all the ages man has worshipped the awe-inspiring sun and rejoiced in the light and brightness emitted by him. "A light to lighten the world" is well said, and contains a wonderful truth that if all were darkness life could not exist, and would be blotted out. Who is there amongst us with a healthy mind who does not rejoice and feel refreshed, no matter what his anxieties, when he wakes from his sleep in the morning and finds the sun pouring in at his window, and sees nothing but blue sky from his bed? And yet how seldom can he be blessed with such a



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sight should he be unfortunate enough to dwell in a factory town. What greets his eyes is just the opposite a dirty house wall and nothing more. And why? What has produced this melancholy vista? Why were there not Cadbury's and Lever's a hundred years ago?

When factories were first built, and the owner was in a small way of business, he lived on or near his work, but when things improved he found that, owing to the prevailing gloom and the ugly architecture of his surroundings his life was pleasanter in the green surroundings of the country, where the smoke, although proceeding from his factory chimneys in clouds, could not reach him. His thought never seemed to have been: build a factory pleasing to the eye, and keep it clean; study the combustion of coal so that the chimney shall not emit smoke in such quantity as to be a nuisance. No, his whole thought was: these are dirty and gloomy surroundings, I will get away from them as soon as I can! He brought his sons up in the country, taught them to love the country life and its pursuits, sent them to school in the country, and was surprised that when they grew up they were inclined to look upon the factory but as a place to work in and make a living—not as a place which they could enjoy and be proud of, and where, if they were so inclined, they could study with a scientific mind the processes by which the article produced was manufactured, and put their minds into their improvement. And so the neighbourhood was left, and the dirt and darkness increased until the last decade of the last century produced a Society (now the National Smoke Abatement Society) which has endeavoured with some success, to awaken the consciences of those in power to the necessity of extending to such towns and cities the light and the clean air which Nature in her bounty

supplies in unlimited quantity and purity, and which only man defiles.

I have been accustomed to preach year in and year out to my patients that no matter how great their material assets were as measured in money or goods, their only asset that really counted was good sound health, with mental and physical efficiency; and that if they would guard that as they did their sovereigns they need have no fear of the future. If this was wise advice to proffer an individual, surely it is wiser by far to a nation. For Public Health authorities it is their first and greatest duty to urge private care of health, and insist, with absolute strictness, the paramount necessity of pure food, undefiled water, and air as nature supplies it.

We know to our cost that many thousands of our youngsters—the future manhood and womanhood of the country—are crippled and maimed from childhood, and will never be able to pull their weight in the boat of life. Is it generally taken into account that by rigid enforcement of all known sanitary precepts a very large proportion of these losses could be avoided?

Let us remember that there is an inherent love of light, of brightness and fresh air, and that all the well-to-do who live in towns consider it a necessity for themselves and their children that they should spend some part of the year away from the gloom of our cities. They, unfortunately, are the exceptional few, and the great majority are forced by their circumstances to stay in the same spot from year's end to year's end. It is for those who can never feel the fillip of a mountain breeze, or the stimulus from the salt air of the sea, that I plead with you not to allow the sun to set to-night without a fixed determination that each of you will do your part in the fight for pure air.

## FUMIFUGIUM

We are pleased to be able to inform our readers that the Society will shortly publish a reprint of John Evelyn's famous pamphlet "Fumifugium: or the Inconvenience of the Aer and Smoake of London Dissipated." Extracts from this scarce but valuable work by one of the most interesting personalities of the seventeenth century were printed in an earlier issue of the *Journal* (Vol. I., No. 2, 1930), when it was mentioned that "The Times" had expressed the hope that some interested Society would some day reprint the pamphlet at a price which would render it available to all.

The extraordinary thing about "Fumifugium" is the similarity of Evelyn's arguments to those used to-day. His remedies would hardly suffice, but as far as his indictment of smoke goes, there is a close parallel between 1661 and 1933. With the tract itself will, of course, be printed the "epistle dedicatory" to the King (Charles II.) and the Preface to the Reader. In addition, because of its own special interest will be included the editorial preface to the 1772 edition. The writer of this comments on the smoke nuisance of a century later, and, it is interesting to note, anticipates the carbonized fuels by urging the Government to encourage the investigation of some method of *charring* coal to render it smokeless.

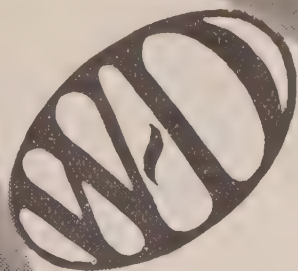
The value of the edition—it is only the fourth time that the work has been reprinted—is greatly increased by an Introduction written by Rose Macaulay. Miss Macaulay is not only a distinguished contemporary novelist, but, as her "They Were Defeated," one of the important books of 1932, shows, she is an historical scholar with a wide and sympathetic knowledge of Evelyn's period.

Although the publication will be decorated with original wood engravings and a portrait of Evelyn, its price will be extremely modest. There will be two styles: in paper covers, at sixpence each; and bound in cloth, stiff, at 1/6 each; both post-free.

The pamphlet will be of considerable interest to those concerned with smoke abatement, and of value as a means of propaganda. In addition, its literary and historical associations will give it an importance seldom met with in such circumstances.

It is now printing, and copies may be ordered from the offices of the Society, 23, King Street, Manchester. It is hoped that members and readers of the *Journal* will not only purchase copies for themselves, but will assist the success of the venture by interesting others in it.





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# Advisory Regional Organization.

*The following Memorandum, the purpose of which is explained in the foreword, has been forwarded to the Medical Officers of Health and Town Clerks of each of the local authorities in the areas which are suggested may be suitable for the formation of new advisory regional committees.*

## Memorandum to Local Authorities on Advisory Regional Organization for Smoke Abatement.

### I. Foreword.

In January, 1932, Resolutions were passed by the National Smoke Abatement Society urging (a) that Local Authorities should combine for the purpose of setting up suitable regional organizations for the administration of smoke abatement law; and (b) that pending the formation of such statutory bodies, Local Authorities should establish Advisory Committees.

These Resolutions were forwarded, with an explanatory Preamble to Local Authorities throughout the country, and, from the replies that were received, it was apparent that the majority of Authorities do not consider the present time propitious for the formation of Statutory Organizations, and therefore would rather the matter were postponed. While still of the opinion that the administration of the law, in many areas, could be carried out more effectively and economically by such co-ordination in place of individual action, the National Smoke Abatement Society does not intend, owing to the existing exceptional circumstances, to take further action at present.

2. It has been resolved, however, that this further Memorandum dealing with the establishment of *Advisory Committees* should be drawn up and circulated to those Local Authorities which lie in areas which appear to be favourably constituted for the establishment of *Advisory Smoke Abatement Committees*, with the suggestion that the nature and functions of such committees be considered and discussed with neighbouring Authorities, with a view to their formation in those areas.

The following explanatory information concerning *Advisory Committees* is respectfully submitted.

### 3. The Nature of Advisory Committees.

An *Advisory Committee*, unlike a *Statutory Committee* or Board, is a voluntary committee of representatives of Local Authorities which does not in any way take over or control the administration of the law relating to smoke abatement as carried out by its members. The functions of an *Advisory Committee* may most easily be explained by quoting the comprehensive "Objects" section of the constitution of one of the existing Committees (West Riding of Yorkshire). This is as follows :

"The objects of the Committee shall be :—

- (a) To bring about a more uniform administration of the law in relation to the emission of smoke.
- (b) To standardize the methods of taking observations.
- (c) In consultation with the various education authorities to organize courses of training for stokers and boiler attendants throughout the area, to arrange for the holding of examinations in suitable centres, and to issue certificates to successful candidates.
- (d) To secure a better understanding between local authorities and manufacturers.
- (e) To arrange for the preparation and distribution of leaflets and other literature dealing with the smoke nuisance and its prevention.
- (f) To keep in touch with all other bodies, Regional and National, engaged in smoke prevention work, and to collect all information relative to the latest developments in smoke prevention apparatus and appliances.
- (g) To keep records of the state of the atmosphere in the West Riding of Yorkshire by the collection of meteorological data.

Any, or all, of these objects could constitute the activities of other Committees.

### 4. Finance.

The cost of running an *Advisory Committee* can be kept very low, and a purely nominal subscription only would be required from each constituent authority. Two guineas per annum from each constituent authority is the maximum subscription paid in any of the existing Committees. Such a sum, or less, is a trifling amount for each authority to bear, and it will be appreciated that no serious financial commitments need be entered upon by any authority joining a Committee.

### 5. Existing Committees.

Three *Advisory Committees* are already in being :—the Midlands Joint *Advisory Council* for Smoke Abatement; the West Riding of Yorkshire Regional Smoke Abatement Committee; and the Manchester and District Regional Smoke Abatement Committee. The Hon. Secretaries of these are the Medical Officers of Health for Birmingham, Leeds and Manchester, respectively. There is also a London Committee of representatives of Local Authorities and Industry, known as the Greater London Joint Smoke Abatement Committee. These Committees have been continuously active since their formation, and have done a considerable amount of useful work. A reading of their Reports makes their successful operation at once apparent.



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Attention should be drawn to the important fact that these existing Advisory Committees were formed through the direct proposal and with the assistance of the Ministry of Health. It is likely, therefore, that new Committees would have the approval of the Ministry.

#### 6. Suggested Areas for Further Committees.

It is tentatively suggested that the following industrial areas would be suitable for the formation of new Advisory Committees :—

- |  |                                       |
|--|---------------------------------------|
| 1. Tyneside and District (to Durham)   | } or : 1.<br>North-<br>East<br>Coast. |
| 2. Tees-side and District (to Darlington)                                    |                                       |
| 3. North-East Lancashire (Chorley, Preston, Clitheroe, Colne, Burnley area). |                                       |
| 4. Mersey-side and South-West Lancashire.                                    |                                       |
| 5. "The Potteries."  |                                       |

It is to Local Authorities in these areas that the present Memorandum is being forwarded.

#### 7. In conclusion we respectfully suggest :—

- (a) That this Memorandum is considered by your Health Committee and by the Council.

- (b) That the principle of the Advisory Regional Committee is approved.

- (c) That the Council intimates its willingness to participate in any Conference of Local Authorities in the area called for the purpose of further considering the matter.

8. Any further information that is available will be forwarded on request by the National Smoke Abatement Society, which will also be glad to assist in any ways steps which may be taken in consequence of this Memorandum. The Secretary of the Society would be glad of the opportunity of attending and speaking at any meeting of Local Authorities held to discuss the subject.

On Behalf of the Executive Committee.

WILL MELLAND, *Chairman*.

ARNOLD MARSH, *Secretary*.

To

23, KING STREET,

THE TOWN CLERK ;

MANCHESTER.

THE MEDICAL OFFICER OF HEALTH. December, 1932.

## Smoke Abatement in Ohio, Bengal and New Zealand.

We have received two interesting reports, one a pamphlet on "Smoke and its Prevention," published by the Engineering Experiment Station, of Ohio State University ; and the other the 26th Annual Report of the Bengal Smoke Nuisances Commission.

The American publication is a survey of the smoke nuisance, its causes and consequences, and methods of preventing it ; and is apparently intended for general distribution as an educational medium. Some interesting statistics on the cost of smoke are given, and these may be somewhat surprising to the many people in this country who are under the impression that the United States, and especially New York City, have abolished their smoke troubles. Henry Obermeyer in 1929 computed the cost of the smoke nuisance in New York as \$17 (68/- at par) per year for each person, and in Chicago as \$65 (£13) per year for each person. The Chemistry Department of the University of Tennessee estimated the monetary loss due to smoke in Knoxville, Tennessee, at from \$15 to \$17.50 per person annually. These figures are considerably higher—especially that of Chicago—than the modest estimates tentatively put forward in Great Britain.

Systematic observations of atmospheric pollution do not appear to be carried out in the United States, but a complete test for the City of Cleveland in 1924 showed that the heaviest deposit was in the down-town section of the city, where a figure of 2,038 tons per square mile

per year was measured. This is equivalent to 79,482 grams per square dekametre, the unit in which the British observations are expressed, and it will be seen how much greater it is than any reading in this country : 21,522 grams per square dekametre for Burnley was the maximum recorded in the last Report on Observations. The lightest deposit in Cleveland was in the residential section, where a fall of 83 tons is similar to that which would be recorded in a residential district in this country.

The methods of preventing smoke are enumerated under three heads, as follows :

1. By changing the type of fuel.
2. By changing the equipment used.
3. By changing the method of manipulating the fire with the present equipment.

In discussing fuel it is shown that the price of anthracite is nearly four times, and the price of coke nearly twice that of bituminous coal. From the smoke abatement point of view of reducing smoke by changing over to smokeless fuels this is an unfortunate factor.

Smoke inspectors or preventive ordinances are advocated, although the author of the pamphlet appears to be rather afraid of the consequences of an unduly strict ordinance and of the possible dangers of a rough-riding or corruptible inspector. It is stated that the annual cost for the proper enforcement of a smoke ordinance has been estimated at about \$50,000 a year for a city having a population of one million inhabitants



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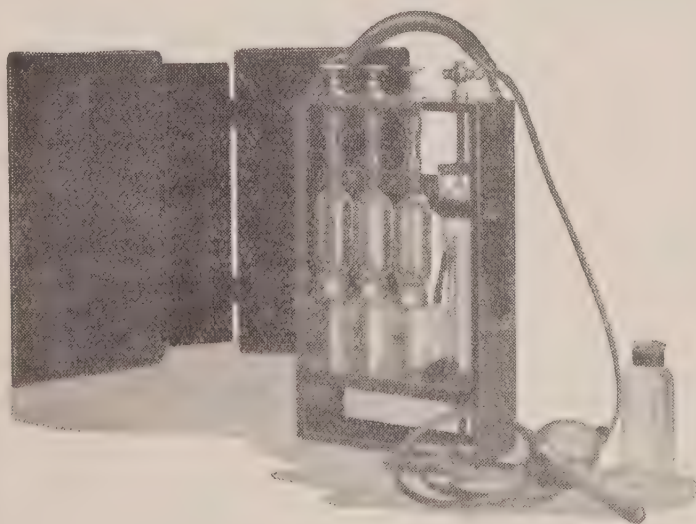
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**Bengal.**

The most striking feature of the Report of the Bengal Smoke Nuisances Commission shows that the observed emission of dense smoke has diminished from 13.1 minutes per hour in 1906, when the work was first started, to 0.08 minutes in 1931. The table shows a progressive decline during the intervening years to this highly gratifying final figure.

Calcutta suffers from an extensive nuisance due to factory smoke, and it also possesses a domestic nuisance of a type unknown in this country. This is the smoke discharged from a quarter of a million domestic furnaces, situated in the open air and discharging their smoke at ground level. In some suburban areas there is "an irritating and suffocating pall through which it is impossible to see even a few yards ahead."

Although no legislation against this is yet in existence attempts are being made to reduce it by means of personal visits by the Inspectors to carry out instructional tests and demonstrations. On the small scale that this has been done it has proved to be successful, and it is intended to extend the knowledge of correct fuel utilisation. An unsuccessful attempt was made in the past to secure the legislation to deal with this evil, but another attempt is to be made shortly.

The following extract from the Report is of interest and may be quoted in full :—

"Scientific smoke abatement and economy require balanced plants. It would be unsatisfactory in a boiler plant where the boilers are large enough, if the draught is insufficient to take the required work from the boiler and it would be unsatisfactory where the draught is ample, if the boiler is too small to produce the required steam. Properly proportioned furnaces, flues, and chimneys are the basic factors for efficient smoke abatement, increasing the power of the plant and reducing the overhead fuel expenses. Under the Act new plants installed or alterations made to the old must be approved by the Commission.

"During the year the Commission examined and approved 52 plans of which 40 were made in the office of the Commission, covering nearly all types of industrial furnace. All were granted permission to construct."

It is noted in conclusion that the use of electricity and gas is rapidly extending in Calcutta.

**New Zealand.**

We are pleased to welcome as an affiliated member of the Society, the Sunlight League of New Zealand, which is actively concerned with the abatement of smoke. There is practically no legislation on smoke abatement in the Dominion, and in Christchurch especially, the combination of smoke and frequent fog is creating a desire for action to be taken. It is anticipated that a smoke abatement Bill will shortly be introduced into the New Zealand Parliament.

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## Fumes from Heavy Oil Engine Vehicles

A paper was read to the North-Western Section of the Institute of Fuel on December 14th, 1932, by Mr. A. T. Wilford, Chief Chemist, London General Omnibus Company, on "Fumes from Motor Vehicles—With particular references to those fitted with Heavy-Oil Engines."

In the course of his paper Mr. Wilford said that the factor which had made the question of motor fumes of such real importance at the present time was the enormous increase in the number of vehicles and the consequent congestion of traffic, particularly in large cities. Atmospheric pollution due to motor fumes was a fact, and traces of carbon, hydrocarbon vapours, and carbon monoxide were constituents of the atmosphere of towns, though happily to an extent far below that likely to have any ill-effects on street users or inhabitants. Burnt, or more accurately partially burnt, lubricating oil was, in the author's opinion, the most common cause of fumes from motor vehicles, particularly petrol-driven ones. If the oil was completely burned the resulting products would be both invisible and odourless, and in view of the fact that the compression ignition

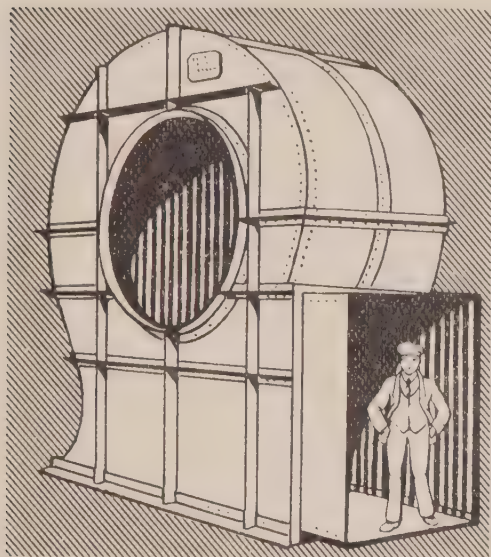
engine was more capable of effecting the combustion of such an oil than was the spark ignition engine, it was certain to prove the lesser offender of the two types in respect of fumes arising from this cause.

In the opinion of many authorities there was no fume problem with the compression ignition engine as they knew it. Such a conclusion certainly seemed justified in the London area, and doubtless elsewhere. It must be conceded that certain designs of engines were more prone to give rise to the trouble than others, and with increasing application of the heavy-oil unit the less satisfactory ones were likely to be eliminated by a process of natural selection. There was no doubt that apart from its advantages over the petrol engine in respect of decreased fuel costs, reduced fire risks and greater flexibility, a compression ignition engine of suitable design was the more capable of completely burning its fuel and was not so liable to produce noxious exhaust products. The future expansion of this class of engine as prime mover for road transport vehicles should therefore cause no anxiety whatever as to its possible effects on atmospheric pollution.



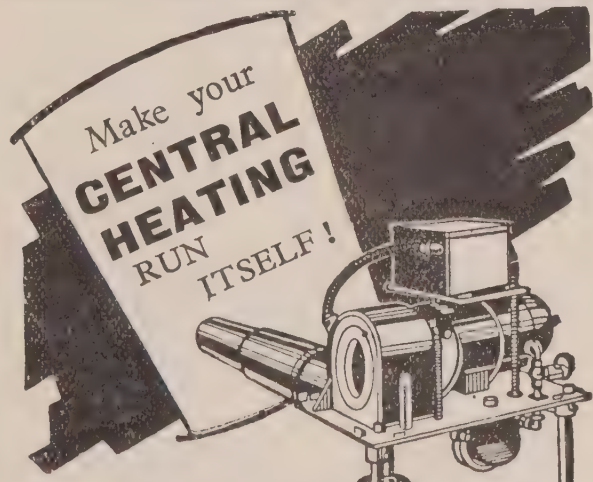
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# The Carbon Monoxide Danger.

The dangers of carbon monoxide poisoning arising from the inhalation of motor vehicle exhaust fumes continue to be stressed by frequent paragraphs in the papers. The following cuttings illustrate two cases of this kind, while the third one quoted suggests that a further serious effect may be induced by petrol fumes.

“How a motor-lorry driver was saved from death by carbon monoxide poisoning was described at Abingdon Police Court yesterday. He was Henry Foster Bulley, of Russell Avenue, Wood Green, London, and he was charged with being under the influence of drink while driving his lorry near Oxford.

“A police officer stopped the lorry because there was no rear light. Had he not done so, it was stated, Bulley might have been dead in half an hour. It was stated in defence that Bulley took up a board from the floor of the driving cabin to keep himself warm on a cold afternoon, and that when stopped by the police he was suffering from carbon monoxide poisoning. The charge was dismissed.”—*Morning Post*.

“Mr. Fred Bond, the popular secretary of the Cheltenham Motor Club, and a motor mechanic, were nearly gassed to death in a remarkable manner yesterday.

“The incident occurred in one of the glass showrooms of Messrs. Haines & Strange’s garage, where Mr. Bond and Mr. Tom Brown were adjusting a car. They had been working for some time when Mr. Brown remarked, ‘I’ve got a rotten headache this morning,’ and Mr. Bond rejoined, ‘Funny, but I have, too.’

“The two men went on with their work when suddenly Mr. Bond fainted. Mr. Brown felt himself sinking into unconsciousness, but with a great effort he stumbled to the door and managed to attract the attention of men who were washing cars.

“They rushed into the fume-filled showroom and carried Mr. Bond into the open. He was laid on the floor, his collar loosened, and water dashed into his face. Brandy was obtained and under its influence he regained consciousness. Mr. Brown, who, fortunately for both, was not so badly affected, soon recovered, and the two men are to-day happy that they were saved from death in the nick of time.”—*Gloucestershire Echo*.

“The dangers of the inside drive in ill-ventilated motor-cars have been pointed out to the Academy of Medicine (of France) by two experts who conduct the medical examinations of drivers of police vehicles. They declare that all motorists should periodically be submitted to toxicological tests in order to determine to what extent their faculties have been deteriorated by petrol fumes. In several cases they have found a serious weakening of the sight, which often precedes syncope.

“After having eliminated all other causes they found that such deterioration of vision caused solely by petrol fumes may amount to 10 per cent. The reason is that commercial petrol is a mixture of pure petrol with other substances such as benzol and crude alcohol.

“These fuels contain hydrocarbons which affect the sight and general health. Persons who drive in closed cars are more liable to such poisoning than drivers of open vehicles.”—*Daily Telegraph*.

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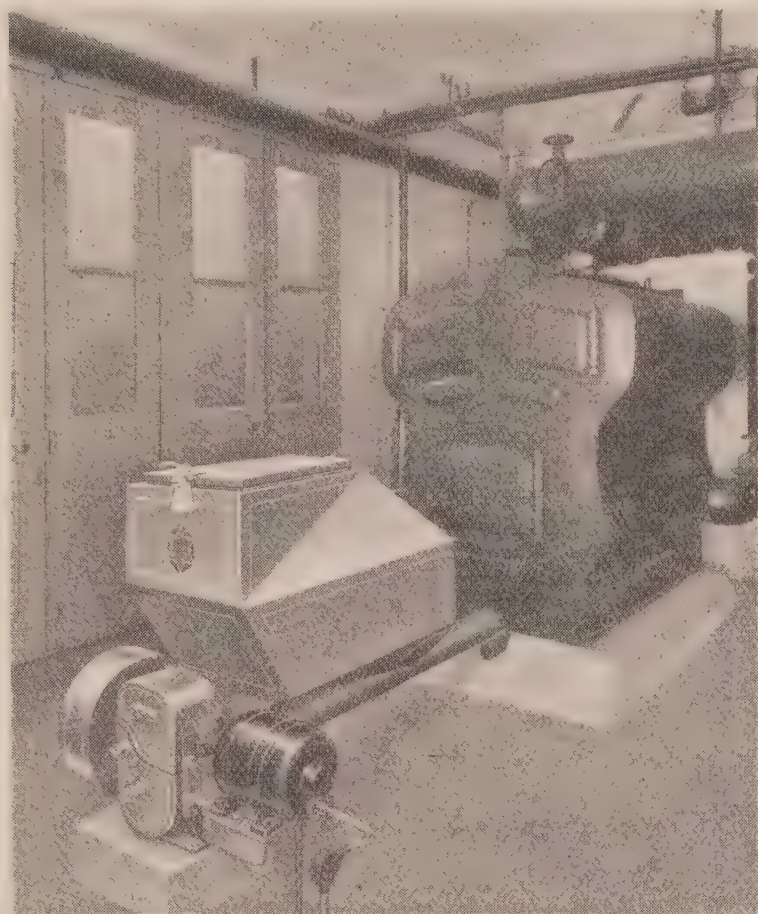
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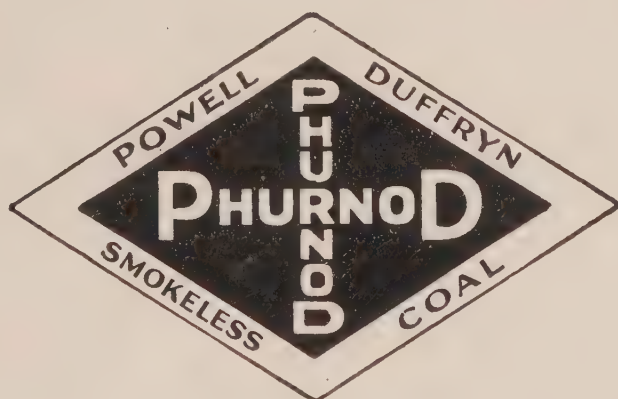
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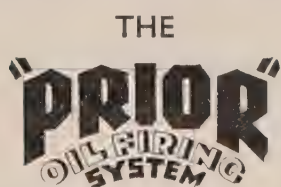
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# The Journal of the National Smoke Abatement Society

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*The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgements are made.*

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## Apple Trees in the Strand.

ALTHOUGH, at the time of writing, the Society's new edition of John Evelyn's "Fumifugium" is not yet published, a successful sale is already assured. Thanks to the fascinating character of the writing itself, the sympathetic introduction by Miss Rose Macaulay, and the low price at which the pamphlet is being sold, there can be no doubt that Evelyn's heart-spoken plea will once again compel attention; and will, in all probability, because it is not now a solitary voice, have a far greater effect than it originally had.

One wonders what Evelyn, sensitive lover of cleanliness and order, would have thought if he could have known that this smoke evil, then peculiar to a comparatively tiny London, would have spread itself over the whole face of Britain,

and that, 272 years after the first printing of his indictment, it would be found valuable to publish it once again, not a literary curiosity, but for the very purpose for which he had written it.

This campaign against smoke is certainly a long drawn-out business, for, although Fumifugium is the first closely reasoned and complete attempt to demand action, the earliest smoke abatement committee seems to have been complaining three and a half centuries before Evelyn. And yet this smoke that caused so much indignation was, compared with what we have to-day, a mere bagatelle confined mainly to one small, though crowded, city. With what consternation would Evelyn view our conditions to-day; and with what despair would he consider the prospects of apple trees ever blooming in the Strand again.



One feels, on reading *Fumifugium*, and especially the third part, that this question of apple trees in the Strand was perhaps nearest of all to the author's heart. He loved flowers and trees, and wished London to be a green and fragrant city, which it could never be while it was covered by that "hellish and dismal" cloud of coal smoke. It could never be the great and beautiful metropolis that was its right while the chimneys poured out their smoke and soot. That charming conception, in the third part of the pamphlet, of flowering gardens around the city—when the smoke had been abolished—shows that he desired more than the mere disappearance of dirt and foul vapours. He did not wish merely for the air to be so clean that apple trees *could* bear fruit in the Strand; he wanted it so that they *should* bear fruit. The clean air was not his final objective: it was the apple trees he desired, and clean air was a condition without which there could be no trees.

Evelyn looks upon smoke in its effects upon health and personal well-being just as we do, and it is surprising to find how close a resemblance his arguments bear to those to be found in any modern paper on this aspect of the action of smoke. And his remarks upon the effects that smoke has upon stonework, metals, fabrics, and furnishings, are as much to the point as ever they could be. But here again what seems to be one of the most insistent thoughts in his mind is that all this "despoiling" degrades and sullies what should be one of the world's fairest cities.

He loves London; he hates the smoke not so much for what it is, but for what it does to the city. His remedy for what we now call the industrial smoke is not to discover means for preventing it, but to have all the works that emit smoke removed from the city further down the Thames.

The case of the apple trees in the Strand seems to be symbolic of an attitude towards the smoke

nuisance that we may sometimes be in danger of disregarding. It may be called the positive case for smoke abatement. Not only does smoke cause effects, but its perpetual presence is effective in preventing other things being attempted.

Take, as a single important example, the question of colour. Clothes for town wear are notoriously drab and dreary: not men's clothes alone, but also those of women. A tailor in Manchester has exhibited the slogan "Manchester suits for Manchester soots." As with our clothing, so our furnishings and decorations have to be chosen with a view to resisting, or rather hiding, the dirt which they cannot escape. Our buildings generally start white and go black, or, if paint is used, a dull neutral colour is chosen so that it may darken gracefully. The correct use of colour plays an important part in life, and from both aesthetic and psychological standpoints it should not be circumscribed and made unattainable as at present it has to be. We speak of the colour of the south and the sparkle of the Italian scene. Some, of course, is due to more abundant sunlight and a drier atmosphere, but much is because we in this country are living in an everlasting fog of our own creation that makes the use of bright colour merely farcical. So we should attack smoke, not merely because it spoils colour, but because its presence prevents a full and satisfying use of colour.

And so with many other factors with which smoke is concerned. We should not confine ourselves to pointing out how smoke destroys and disfigures what does exist, but that it also effectually makes impossible what should exist.

Air pure enough for apple trees in the Strand is an excellent ideal; but the apple trees are even better. The fact that there is at present no thought of apple trees in such a place does not affect the argument. When Evelyn's dream comes true and the smoke of London is at last dissipated there will be seen greater marvels even than that.



# Classes for Stokers in Practice.

By THOMAS M. ASHFORD, A.M.I.Mech.E.

*Chief Smoke Inspector, Glasgow.*

## Necessity for Classes.

The work of control of industrial smoke is primarily of an advisory nature. The duties of those responsible consist not only of the detection of the smoke offender, the noting and recording of the extent of his transgression, and, should the necessity occasion it, the enforcing of the provisions of the various statutes by reporting persistent offenders, but also in assisting plant owners and operatives by their advice to avoid recurring excessive smoke emissions and incidentally to increase the efficiency of the plants and reduce on-cost charges. This latter is considered a most important part of an official's duties, and as the result of efforts in this direction much success has accrued and many radical and lasting improvements have been effected from the practical advice offered daily to non-technical principals or officials of firms and to the boiler or furnace stokers and attendants themselves much fruit has been borne. The full benefit of this advice can only be achieved if the latter have a thorough grasp of the principles of fuel combustion, furnace management, and boiler efficiency, and this is only to be gained by private study, or attendance at some technical institute or college or at some of the specialised classes which have been organised under the auspices of the National Smoke Abatement Society.

It is generally found, however, that the curriculum at a technical institute is of a much higher standard than is necessary or desired by the average stoker or furnace attendant, apart from the fact that his previous education may render it very difficult for him to benefit fully by the instruction given. In other words, the syllabus in the evening classes at the college is too academic for his immediate purpose, even assuming that the average operative had the inclination for such study—which he certainly has not. It is for the above reasons that the various courses of study as organised and run in a number of centres throughout the country are so necessary and so beneficial. The courses are complementary to the general work of administration.

## Organization of Classes.

Classes such as the above, while primarily intended for the education of stokers, etc., in the best methods of smoke prevention, should also deal very fully with the subject of boiler efficiency, viz., the most approved and economical methods of stoking and fuel combustion and how to obtain the maximum return in steam generation with the minimum consumption of fuel and obviously the minimum of smoke production. In this way the sympathy and co-operation of plant owners and users is enlisted as the tuition, apart from being in the interests of a purer atmosphere, is also vitally

assisting in the reduction of power costs, and it is to the employers' economic interest to facilitate and encourage the attendance of their men.

Routine observation work shows that an undoubted improvement has taken place in the behaviour of the active chimneys and consequently in the condition of the atmosphere in recent years. It is believed that this is largely due to the knowledge obtained by the men through attending these classes being put into daily practice. In support of this statement that substantial advantage is derived by stokers from the classes, it may be pointed out that in few of the prosecutions for smoke offences during past years have members of these classes been involved.

As well as securing the sympathy and active co-operation of the plant owners, the voluntary interest of the men themselves must be stimulated. Any form of coercion is fatal as it only engenders resentment and the object of the classes is thereby defeated. It must be remembered that the men who are likely to attend these classes have long since left their school days behind them and have been for some time accustomed to the comparative freedom of the public work. These men will certainly look askance at any course of study if the methods of tuition savour too much of the atmosphere of the schoolroom.

The locus of the class or classes must be as far as possible centrally situated within the district from which the members are to be drawn, and to facilitate this the co-operation of the local authority, technical institution, or public educational body may be enlisted. By this means suitable accommodation can be arranged.

The duration and frequency of the classes must not make too exacting demands upon the time of the men—say, one hour's lecture on one evening per week, the evening being chosen to interfere as little as possible with the indoor recreational attractions of the district. The course might extend to twelve lectures.

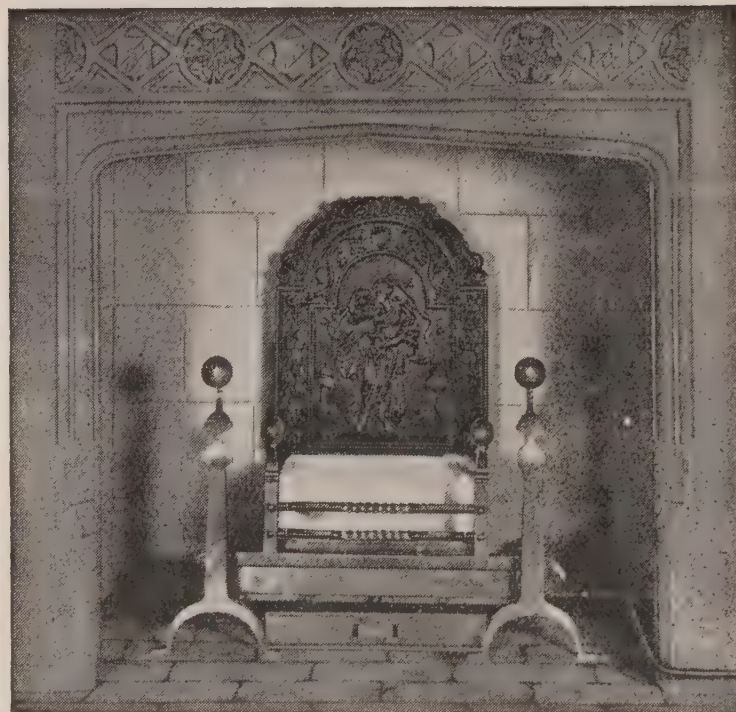
The local body having decided upon a suitable comprehensive syllabus and also the venue of the class, appropriate circular literature should be drafted out.

(1) A letter should be sent to the employers (a complete list of whom, of course, will previously have been compiled, with the approximate number of stokers, etc., employed), stating fully the object and scope of the classes, enlisting their support, and asking them to give their men every encouragement to attend the classes as regularly as possible in their own interests as well as in the interests of a purer atmosphere. It might also be suggested that whatever nominal fee is decided upon could with general advantage be paid



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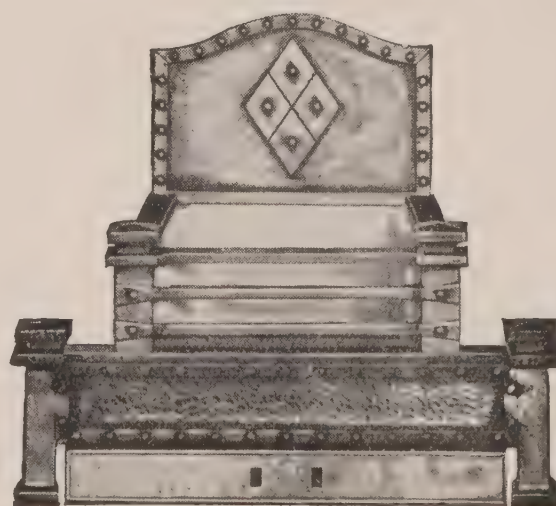
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by the employers as a further inducement to their staffs to attend. At the same time the employers might be invited to extend their co-operation by becoming members of the Society.

(2) A number of letters to be distributed by the firm to those members of their staff who are interested might be enclosed with the above letter, intimating the date of commencement and the venue of the classes and any other details necessary, at the same time informing them that their firms have been approached with a view to the granting of facilities, if necessary, to enable them to attend, and inviting their enrolment, the amount of the nominal fee being stated.

(3) Along with these two letters a full copy of the scheme of instruction in the class, and, where an advanced class is run in conjunction with the first year or ordinary class, a full calendar of lectures might be enclosed. It should also be stated that the course will be terminated by an examination, on the result of which merit certificates of competency will be awarded to those obtaining the agreed pass percentage of marks. Should it be decided to award prizes to, say, the best three students in the class, this might also be intimated as it will tend to promote healthy competition among the members. During the course a careful register of attendances should be kept, and a qualifying number of attendances for the examination may also be insisted upon.

It is generally found that a proportion of the men work on varying shifts, and this factor, especially during the first session, will militate against the attendance, but during subsequent sessions an advanced class may be introduced on alternate weeks, the syllabus of the two classes being similar but treated more exhaustively at the advanced class. Attendance at this latter class may be optional to first year students, if they so desire, on payment of the one nominal fee. This arrangement aids materially in reducing breaks in the continuity of attendance in the syllabus course.

The lectures should be commenced punctually and finished punctually. Five or ten minutes might be allowed at the end of each lecture for discussion, as this has the effect of bringing out many points upon which individual students may desire further information and which the lecturer may not have had time to discuss during the lecture. This arrangement will usually be found to be taken full advantage of, and it is effective in further stimulating interest along practical lines.

A comprehensive list of wall charts should be provided either prior to or during the lecture course, illustrating the subjects of each lecture. Without a series of charts such as these, the instruction cannot be so successfully imparted. In the specimen syllabus appended hereunder, a total of thirty such charts is required.

The lecturer obviously must avoid as far as possible

complicated technicalities, introducing only such as are necessary; in other words, he must be careful not to talk over the heads of his listeners. He will find that he will be approached at the termination of each lecture by those students who wish to have more technical explanations of any of the points raised, and he must be prepared to meet these as they arise.

In addition to the wall charts, if a number of working models of mechanical stokers and various types of grates can be procured either by loan or purchase from the various makers of these appliances they will be found to be of great advantage in explaining the practical details and operation of the machines. This has been the writer's experience.

Two of the lectures might be illustrated by lantern slides showing the detailed construction and assembly and also the general arrangement and lay-out of various mechanically stoked plants and appliances, the necessary slides being obtained on loan from the respective makers. These are very willingly supplied by them.

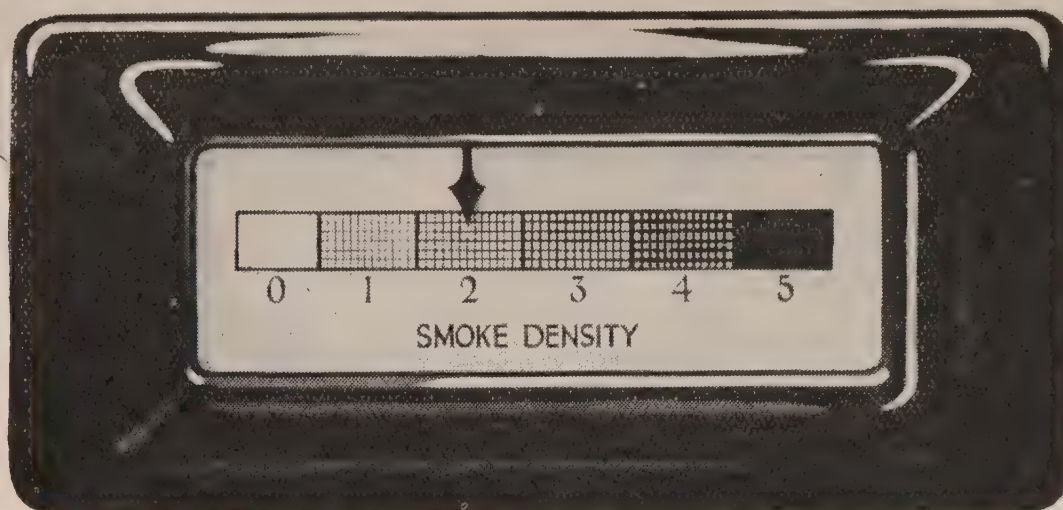
Again, two Saturday afternoons might be devoted to the visit and inspection of several high efficiency plants in the neighbourhood or within a reasonable distance, when either the lecturer or a representative of the plant can explain the salient details of the appliances installed. On the question of practical demonstrations to boiler and furnace attendants in the various methods of stoking, there is difference of opinion. The writer does not consider this to be necessary, as experience has shown that the average man resents being taught how to use a shovel, but is quite willing to stoke himself in the methods instructed if the reason for so doing is explained to him.

As soon as possible after the last lecture of the course the class examination or examinations should be held. The writer's practice has been to hold the examinations on the Saturday afternoon succeeding the last lecture. A comprehensive list of questions may be arranged, the first two or three of which should deal with the theory of the subject, the remainder being of a practical nature, and the whole should be based entirely on the work of the course as given in the lectures, although the questionnaire can be framed to cause the student in his answers to employ the principles which he has learned. The advanced examination paper, while drafted on similar lines, will naturally require much fuller statement or discussion in the answers than is the case in the ordinary examination. From fourteen to sixteen questions might be set, but only eight of these must be answered, the value of each question being marked on the examination paper.

The examination may be conducted by two examiners, one of whom, in the writer's opinion, should be the lecturer himself. The papers should be carefully checked over by each of the examiners separately, the individual assessments being later compared and



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adjusted. As the intention of the classes is to teach the men the basic principles of the subject so that they may be enabled to put these into practice in their daily work, little or no note need be taken of the grammatical style or spelling of the papers as this will depend entirely on the general educational standard of the candidate. This will be found within very wide limits in the usual personnel of a class of this nature. The examination is to find out what each individual "knows" and what he can put into practice, and it is for this reason that it is suggested that one of the examiners should be the lecturer himself as during the session he will have become generally conversant with the practical abilities of many of the men, certainly those who appear to be very backward in expression. The writer had one experience of a man who simply could not express himself in writing, but could answer the questions set very well when examined orally, and was awarded a merit certificate.

It will be noted that throughout the foregoing observations the writer has laid particular stress on a close study of the men. This, as a result of considerable experience, he has found to be of the utmost value if definite results are to be secured.

The classes for firemen, boiler attendants, engineers, etc., have been carried on in Glasgow under the auspices of the Scottish Branch of the Society continuously since 1910, with the exception of the War years, the present session concluding towards the end of March being the seventeenth. Since the inception of the classes, over 1,500 men have passed through them, an ordinary and an advanced class being carried on each winter session meeting on alternate weeks, at each of which twelve lectures are given. Facilities are granted for attendance at either or both classes on payment of a single nominal fee of 2/6, which is usually paid by the employers, and in many cases travelling expenses are also included. This arrangement is taken advantage of by a large number of members as it is obligatory in many cases owing to the change over in working shifts.

For the past four years the enrolments have been around 100, the average attendance for the session for both classes being over 80 per cent. Full attendance certificates are granted to those who qualify but who are not entitled to a merit certificate of competency as the result of the examinations. In addition, a pocket folder certificate is also given to the merit certificate winners, and this is found to be very useful when seeking employment. The classes are held in a very

comfortable lecture room in the City Chambers, and are thus very central. The three leading students in the respective examinations are also the prize-winners.

During the past few years very successful classes have been held under the auspices of the Society and Local Authorities and County Educational Committees in Edinburgh, Paisley, Coatbridge and Irvine.

Appended is the scheme of instruction given in the Glasgow classes.

#### **Scheme of Instruction in Classes to Firemen, etc.**

The composition of the more common fuels in use for steam production, and the efficient generation of the gases of combustion in contact with air.

The generation and characteristics of flame, and the conditions required for its production and continuance in furnaces and flues.

The principles on which boilers and their furnaces are constructed and should be managed.

The causes of smoke production and its effects. Methods of stoking.

How natural draught is produced; the effects of good and bad draught upon combustion.

The circulation of water in a boiler in relation to evaporation and its influence on the transmission of heat.

The characteristics of (a) Lancashire boilers, (b) Galloway boilers, (c) vertical boilers, (d) multi-tubular boilers, and (e) water-tube boilers; their virtues and defects compared.

Steam road vehicles; types; care and management of boilers; choice of fuels, etc.

The use in boiler furnaces of special appliances of various kinds for the elimination of smoke; their virtues and defects discussed.

Mechanical stokers in use; their virtues and defects.

Various forced draught furnaces in use; their advantages and disadvantages. Grit collectors.

Economizers and air pre-heaters; their characteristics and advantages.

The working of the CO<sub>2</sub> recorder and the assistance it may give to firemen in regulating the supply of fuel and air in their furnaces.

Causes of scale formation in steam boilers and its effect on efficiency, etc.; anti-scale forming methods of treating feed water.

Oil fuel burning—some systems discussed, with notes on operation. Notes on pulverized fuel.

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London is like Hell—smoky and populous—

*Professor A. E. Richardson.*

"I move that it lie on the table; we still want more smoke here," declared Mr. W. Burkitt at yesterday's meeting of Auckland Rural Council, when the Clerk

(Mr. Walter T. Foster) was about to read a letter which he had received from the secretary of the National Smoke Abatement Society.

Mr. Burkitt's suggestion was approved without further comment.—*Newcastle Chronicle.*





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## Smoke and Health

*By courtesy of the Editor, we are able to print the following leading article from a recent issue of "The Medical Officer." The points raised will be of considerable interest and value to our readers.*

### ATMOSPHERIC POLLUTION.

Dr. H. Osborne, medical officer of health for Salford, devotes a chapter of his annual report for 1931 to atmospheric pollution, a subject about which we hear much said and see little done. Though not amongst the worst examples in England, Salford is not a mild offender, for as Dr. Osborne informs us, the monthly deposit of *tar* from the atmosphere averages one ton per square mile. This is about twice as much as is deposited in London. The acid deposited is equal to 24 tons of sulphuric acid per square mile, which is nearly ten times that in London, and is, so far as we can recall, a record for any English town. Dr. Osborne discusses the possible effect of this high atmospheric pollution upon the incidence of cancer of the lung and upon bronchitis fatality. He shows a probably significant relationship in the case of the former, but a strong relationship in the latter, which is more startling than we anticipated.

Atmospheric pollution may be presumed to be damaging to health from interference with light, from chemical damage to the respiratory mucosa, from chemical and mechanical damage to the surfaces, especially of the cornea and from systematic poisoning from the absorption of toxic products. Though the impurities sent out into the atmosphere by towns are not limited to the places which produce them—the heather of the Yorkshire moors is thickly coated with West Riding soot—there is a marked difference between the atmosphere of towns, especially grouped industrial towns, and that of the open rural districts, so we should expect that the country folk should be far healthier than townsfolk. Candidly we do not find this, a fact which those who oppose smoke abatement use freely and illogically. We do find that country people when they go to town suffer much for a time, but they get acclimatised, and those who are town-bred seem to get along with their smoke-laden atmosphere without much apparent disadvantage. It has been shown that the slum child, though smaller and paler than his country cousin, is equally healthy and far better able to live in his usual habitat than is the apparently more robust

country-bred child. This is, however, only one side of the story. Admitted that we can adapt ourselves to live in a polluted atmosphere, what price do we pay for adaptation and what happens when adaptation is overstrained? There are many reasons why town dwellers should be healthier than country dwellers, and no excuse at all why they should not be enabled to live much more healthily. We do know that geographical position, in itself, does not have any particular bearing upon health, yet most of our grouped towns—Manchester and environs, the Black Country, Tyneside, South West Riding, etc., show up unfavourably, and there is strong reason to believe that smoke is the chief culprit in this connection. Dr. Osborne compares the bronchitis mortality in various towns, showing that there are four great towns—Bournemouth, Eastbourne, Norwich and Wallasey—with rates below 600 per million, and twelve with mortalities above 1,200 per million. The Manchester group has five towns—Manchester, Oldham, Bury, Salford and Rochdale with rates above 1,200; of these Oldham is worst with 1,500 and Salford least bad with 1,239. The difference between Oldham (1,506) and Wallasey (507) represent 1,000 per million—rather more than the standard mortality from tuberculosis. Put dramatically, if the bronchitis mortality of Oldham could be reduced to that of Wallasey it would save more lives than would stamping out tuberculosis and more than two-thirds than stamping out of malignant diseases. We must, however, be careful, for bronchitis is one of the "normal" causes of death, so it must be shown that the people of smoky towns die earlier from bronchitis than do those of pure air towns before we can accuse the former of being unhealthy. Can this be shewn? As a rough guide it may be taken that death from bronchitis before sixty-five years of age is always abnormal; above that age it may be passed as normal. Bronchitis is only one of the gifts of smoke-laden atmospheres, illnutrition and anaemias are others, and there are many more; but the case against smoke may rest on the increased bronchitis mortality which can be stated precisely to withstand all criticism.

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# Atmospheric Pollution, 1931-32.

The 18th Report of the Investigation of Atmospheric Pollution, for the year ended 31st March, 1932, has just been published. (H.M. Stationery Office, 5/-). Members of the National Smoke Abatement Society will be interested to learn, if they are not already aware, that Dr. H. A. Des Voeux is now Chairman, in place of Sir Napier Shaw, of the Standing Conference. The Standing Conference consists of representatives of the bodies, totalling 37, co-operating in and subscribing to the scheme. In addition to this 28 other bodies, mainly local authorities, also contribute to the cost of the investigation.

95 gauges and 13 automatic filters are at present in use, and 10 authorities are now making regular measurements, by the new method, of the sulphur content of the air.

In all, about 40 bodies are taking observations, their apparatus ranging from one gauge to, in the case of Glasgow, nine gauges and five automatic filters.

The mean monthly deposits recorded in the year 1931-1932 are as follows, the figures being for "total solids" :—

## Total Solids, Mean Monthly Deposits, 1931-1932. (In English tons per square mile).

### LONDON—

Archbishop's Park	..	..	31.08
Finsbury Park	..	..	19.99
Golden Lane	..	..	25.27
Horseferry Road	..	..	31.59
Kew Observatory, "N"	..	..	9.69
Kew Observatory, "S"	..	..	10.76
Mount Street	..	..	27.39
Ravenscourt Park	..	..	39.32
South Kensington (M.O.)	..	..	19.15
Southwark Park	..	..	21.17
Victoria Park	..	..	16.29
Wandsworth Common	..	..	15.20
Westminster (King Charles St.)	..	..	20.99

### ASHINGTON—

High Market	..	..	61.58
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### BIRMINGHAM—

Central	..	..	28.89
West Heath	..	..	14.38

### BOURNVILLE—

Village	..	..	9.18
Works	..	..	10.61

### BRADFORD—

Central	..	..	35.11
North	..	..	11.68

### BURNLEY—

Queen's Park	..	..	27.44
Town Hall, No. 1	..	..	35.80
Town Hall, No. 2	..	..	38.94

CARDIFF	..	..	13.31
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CASTLEFORD	..	..	25.37
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CHELTENHAM	..	..	17.60
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### DEWSBURY—

Manorcroft	..	..	20.55
Ravensthorpe	..	..	15.86
Whitley	..	..	9.92

### EDINBURGH—

Bruntsfield House	..	..	14.97
Leith Links	..	..	13.67
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Belle Vue Park	..	..	11.96
Infirmary	..	..	10.12
Wade Street	..	..	23.38
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York Road	..	..	24.10

### LEICESTER—

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Town Hall	..	..	31.03
Western Park	..	..	7.22

### LIVERPOOL—

Cambridge Street	..	..	25.12
Netherfield Road	..	..	44.22

LOUGHBOROUGH	..	..	21.96
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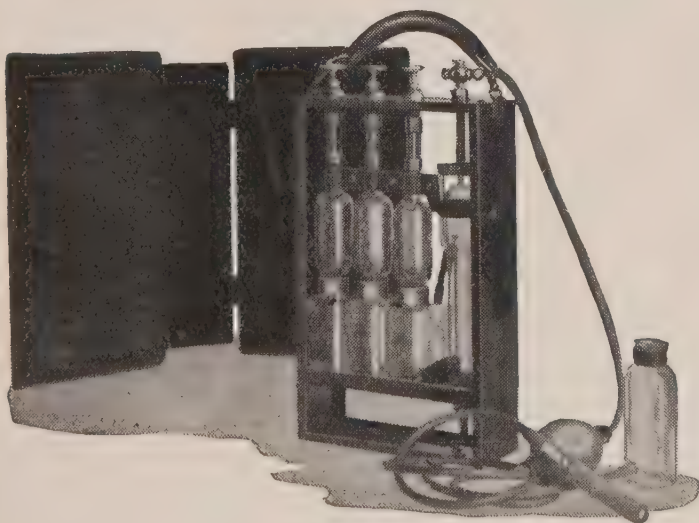
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<b>ST. HELENS</b> .. .. .			
<b>SALFORD—</b>			
Drinkwater Park	..	..	17.82
Ladywell Sanatorium	..	..	16.12
Peel Park	..	..	20.55
<b>SHEFFIELD—</b>			
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<b>STOKE-ON-TRENT—</b>			
Leek Road	..	..	18.82
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The perusal of these figures is of considerable interest, although for a full understanding of their significance it is necessary to turn to the full tables, giving the deposits of the analysed components, in the Report itself. The highest deposit of all, it will be observed, is for Ashington in Northumberland, a new station, while the lowest is Western Park, Leicester, with readings of 61.58 and 7.22 tons per square mile per month, respectively.

#### Changes in Pollution.

Space will not permit a full consideration of the changes which are indicated by the newly-published figures, but the position as a whole is summed up in the following table, which is a comparison of the results under review with the "general average" for each station, separately.

*Comparison with General Average.*

	No. of Stations showing Reduction	No. of Stations showing Increase	No. of Stations showing no Difference
<b>Insoluble Matter—</b>			
Tar .. .. .	23	13	11
Carbonaceous other than Tar	33	13	2
Ash .. .. .	36	12	0
<b>Soluble Matter—</b>			
Loss on Ignition .. .. .	35	14	1
Ash .. .. .	45	5	0
Total Solids .. .. .	40	9	0
<b>Included in Soluble Matter—</b>			
Sulphates .. .. .	35	11	0
Chlorine .. .. .	42	5	1
Ammonia .. .. .	32	8	8

This is a comparison of the individual stations with themselves, but similar figures have been obtained for the whole group of 47 stations. The average for all stations is given for the current year compared with the

"general average" of those stations having records for four or five years. In this case the only stations used were those for which "general averages" were available, and which had complete returns for the current year.



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*Mean Monthly Figures for the Whole Group of 47 Stations showing the Deposit for the Current Year and its Percentage of the General Average.*

*(Deposit in Metric Tons per Hundred Square Kilometres).*

	Rainfall (mm)	INSOLUBLE MATTER			SOLUBLE MATTER		Total Solids
		Tar	Carbona- ceous other than Tar	Ash	Loss on Ignition	Ash	
Current Year .. ..	65	12	152	304	147	214	831
General Average .. ..	66	15	183	344	167	255	964
Percentage ... ..	99	80	83	88	88	84	86

It will be seen that in the case of every component there has been an improvement, the total solids showing a reduction to 86% of the general average, and tar falling to 80%. It is clear, therefore, that on the whole there has been a considerable improvement. Industrial depression will have had some influence upon this, but the figures for tar, which is essentially a product of domestic fires, seem to indicate a definite reduction from this source.

#### **"Active" Sulphur.**

In addition to a new volumetric method of determining the quantity of sulphur in the air, which is described in the 17th Report, tests are being made upon a further method recently evolved by the Building Research Station. This consists essentially of exposing a paste of lead peroxide to the atmosphere, and, after a certain period (one month in the standard), estimating the amount of lead sulphate formed by the action of sulphur dioxide. It is pointed out that this method provides a direct index to the activity of sulphur impurities, and not merely a measure of their concentration. It is therefore in close relationship to the degree of attack by sulphur upon building stones or exposed metal.

#### **The Significance of Records.**

A valuable account is given, as an Appendix, of an investigation carried out at Kew Observatory on compari-

son between the deposit collected in neighbouring gauges, and the effects of placing gauges in protected positions, e.g., as near to a building. The conclusions reached as a result of this investigation are given as follows :

(i) Pollution gauges exposed alongside one another should give practically the same rainfall month by month, but discrepancies of the order of 30 per cent are to be expected in the monthly records of deposited impurity, but the margin of doubt in the annual totals is not more than about 10 per cent.

(ii) The shielding of a gauge by placing it near a building has the effect of reducing both the rainfall records and those of deposited impurity, but the proportionate reduction in the latter is less than that of the rainfall. Shielding reduces in about the same ratio both the amount of soluble and of insoluble deposit.

(iii) Special precautions should be taken to avoid any risk of extraneous water finding its way into receiving bottles through faulty connections. In the case of gauges of the type now issued, lashing the rubber bung to the neck of the bottle is effective.

(iv) Protection of the receiving bottle from being burst by frost or of the gauge as a whole from accidental damage may be provided by placing a metal cylinder round the gauge.

"Mr. R. C. Rodgers, a past president of the Chamber of Commerce, who presided at a luncheon to the building trade representatives, said that the object of the (British Industries) Fair was to find work.

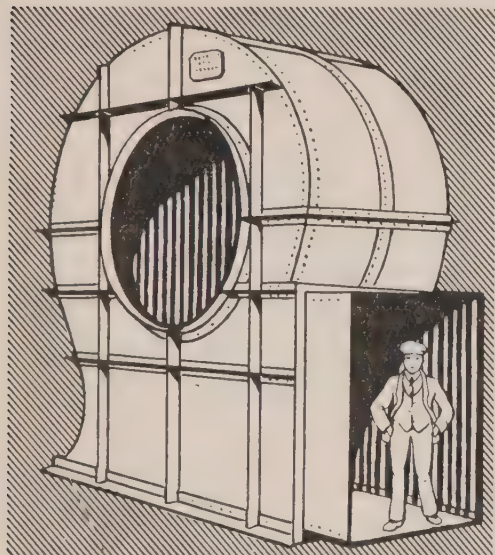
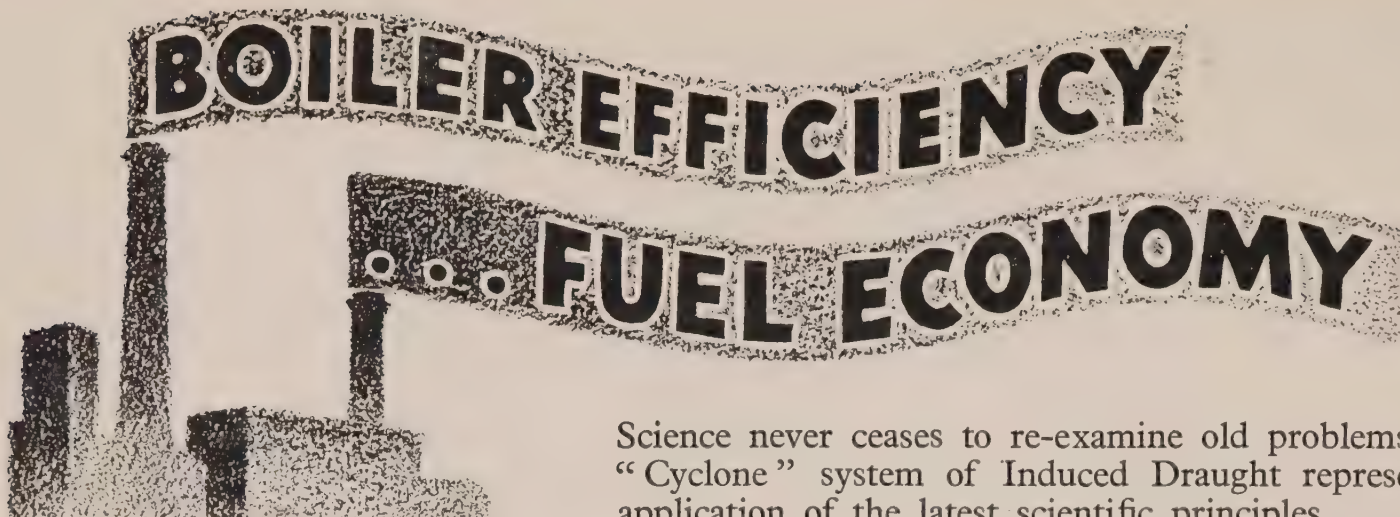
'We want to see smoke emission from every factory chimney,' he added, 'because that will indicate that the operatives and the staff are at work and that the wheels of machinery are revolving.'

Money was useless unless it was widely distributed,

and unhappily there was the startling fact that there were 150 millions lying idle in the banks."

So read a paragraph in the *Birmingham Evening Despatch*. It may be suggested that some careful research might discover other means of indicating that the operatives and staff are at work. Or why not burn the money in the banks, so that resultant smoke will indicate activity there? After all, there would be little economic difference between wasting coal-wealth and wasting money-wealth.





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## Gas Coke in Halifax.

In any discussion on the domestic smoke problem agreement will always be reached that, no matter how great strides are made by gas and electricity and solid smokeless fuels such as semi-coke and anthracite, there is a vast potential market for a solid fuel which can be purchased in small quantities as conveniently and at no higher price than cheap house coal. In hundreds of thousands of the small houses which are crowded together in every town, fuel is purchased by the single hundredweight, or even in smaller units than that, and the question of one penny in the price is of greater moment than the smokelessness, the cleanliness, or even the heating efficiency of the fuel.

That is why it is so important that the sale of free-burning, low-ash gas cokes should be developed as extensively as possible in the urban areas. Such developments are taking place in a number of towns, and in particular considerable success has been achieved in Halifax.

15% of the total output of coke from the Halifax Corporation Gas Works is sold for industrial purposes, and the remainder is sold for the heating of premises, domestic purposes, and for the baking of bread in bakehouses. All this fuel is graded. Coke is delivered direct to customers in three sizes of bags, at 1/3, 10d., and 6d. each. In addition to this, one hundred and forty shopkeepers in the town sell coke in 3d. bags over the counter. Last year the number of 3d. bags sold was no less than 231,121, and of the 1/3 bags, 104,857. The 6d. bag is a new line.

Mr. W. B. McLusky, the Engineer and Manager of the Gas Department states that : " If every householder used from 1½ to 2 cwts. of coke per month, the whole of the output of the country would be absorbed.

But the fuel must be cut with precision to the sizes required if these sizes cannot be found in sufficient quantity by screening. In every case where the coal is carbonized in continuous vertical retorts the aggregate as it leaves the retorts contains probably not more than 15% of pieces that would not go through a 2½ inch ring. If there is no industrial demand for these large pieces then they must be cut into the following sizes to meet the demands of the large variety of customers who require the fuel in one or other of the following sizes :—½, ¾, 1½, and 2 inches.

"After the coke has been divided into the various sizes (and this is done by very efficient screens) it is necessary to de-breeze the fuel as it leaves the overhead storage bunkers or hoppers to enter the consumers' carts or vehicles, or to be filled into bags containing various quantities to suit consumers' requirements. This shaking and de-breezing of the fuel as it leaves the storage bunkers is imperative.

"After all these things are done with precision all the fuel will be sold, in fact there will be a demand for it. Of course it is assumed that the fuel has been made from specially selected coals, " single " coals that will produce by themselves the kind of coke required, or " blends " of equally pure coals ; and except in the case of coke ovens the producer of gas and coke has a choice of coals at his command."

The fact that nearly a quarter of a million bags of coke can be sold over shop counters in one year in a town of less than a hundred thousand inhabitants, shows that there is a substantial demand for a good fuel to be purchased in this way. And to supply every type of demand is the only way of progressing with domestic smoke abatement.

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## Combustion in the Boiler Furnace.

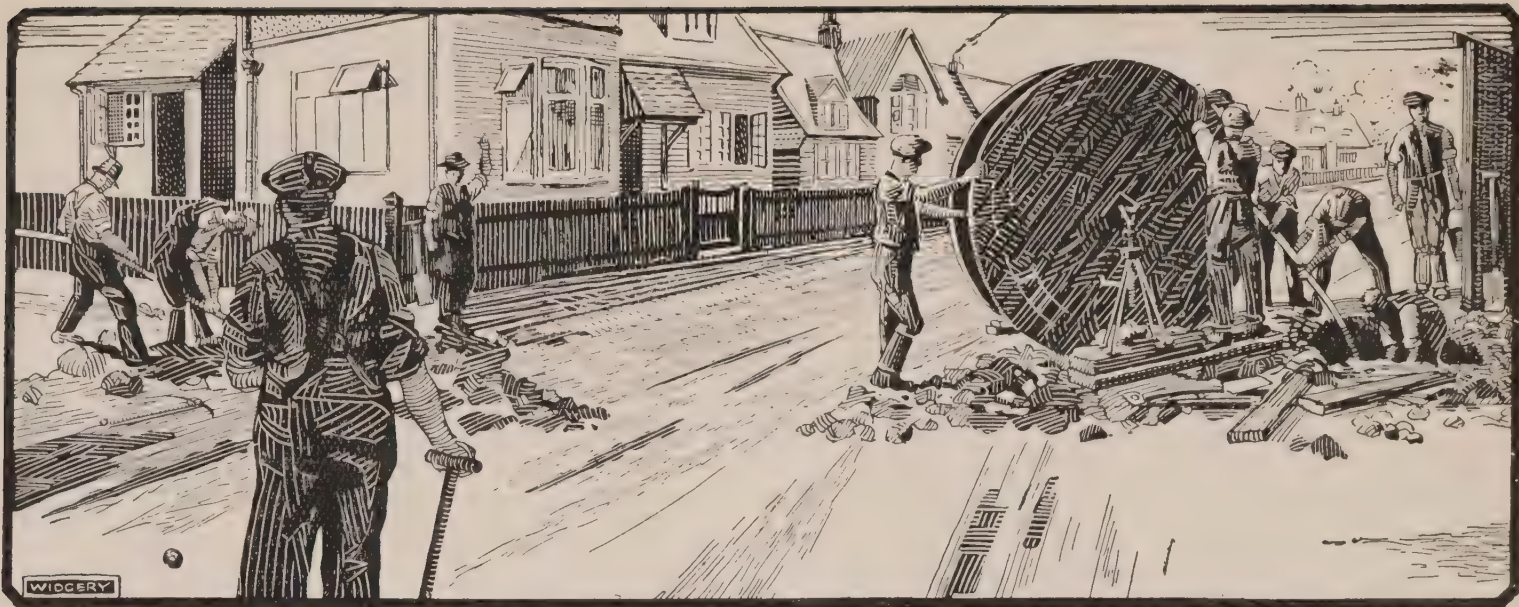
Mr. H. J. Hodsman, M.B.E., M.Sc., F.I.C., of the Department of Coal Gas and Fuel Industries, the University of Leeds, has written a twenty-four page booklet on "Combustion in the Boiler Furnace" (Jowett and Sowry, Ltd., Leeds, 1/-) which is issued with the approval of the West Riding of Yorkshire Regional Smoke Abatement Committee.

This is a small text-book for stokers and boiler attendants who are studying, either through a class at a Technical School or otherwise, the efficient and smokeless combustion of coal. In language which avoids, as far as possible, the more technical and abstruse terms, the book deals with the elements of the chemistry of combustion ; the nature of different fuels

and the methods required for their efficient combustion ; and the composition, quantities, and importance of the flue gases.

With a thorough knowledge of the contents of Mr. Hodsman's pamphlet the stoker will have a clear idea of the principles underlying his work and the processes of combustion. When such an understanding is reached it requires principally the application of common sense to utilize the right methods. Without this basic knowledge the stoker, no matter how experienced he may be, is only working more or less in the dark, or by rule of thumb. This publication should do much to help him to understand what should happen and how to ensure that it does happen.





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## **ELECTRICITY IS THE ENEMY OF SMOKE**



## Progress of the Grid.

The Fifth Annual Report of the Central Electricity Board (Whitehead, Morris, Ltd., 5/-) shows that 7 per cent. more electricity was generated in Great Britain in 1932 than in 1931 by the public electricity supply undertakings. This country now takes third place in the world production of current.

That such progress should have been made in the present adverse circumstances is largely due to the approaching completion of the grid. The grid (about which a full paper was read at the Liverpool Conference of the National Smoke Abatement Society in 1931) comprises about 3,000 miles of primary transmission lines operating at 132,000 volts, and 1,000 miles of secondary lines operating at 66,000 volts and below; the whole network linking certain selected power stations and the systems of the local electricity undertakings. All the wayleaves for the erection of overhead lines have been obtained (with the exception of a few miles chiefly in the New Forest area), and during 1932 over 1,350 miles of towers were put up, leaving only 216 miles to complete the interconnection system. Work is also well advanced on the transforming and switching stations through which bulk supplies of electricity will be taken for distribution to consumers; 244 out of 273 of these sub-stations being ready for use. In

the Glasgow and Stalybridge districts the standardization of frequency at 50 cycles a second, which is an essential part of the interconnection scheme, has been completed, and elsewhere it is well under way. For two of the nine areas into which Great Britain (without North Scotland) is divided a grid tariff has been fixed, and trading has begun.

### The Atmospheric Conditions of Glasgow.

The technical problems arising during construction of the grid have necessitated continuous research work, and important advances have been made. It is of especial interest to those concerned with smoke abatement to note that special anti-fog insulators to overcome flashover difficulties have had to be devised on account of the difficulties caused by the atmospheric conditions of Glasgow. A new development in transmission practice is that of drawing the 66,000 volt underground cables into steel ducts and surrounding it by nitrogen under pressure. This is the first of its type to be put into commercial operation in the world.

The total cost of the grid, excluding frequency standardization, will be about £26,700,000, which represents an increase of only about 2½ per cent. over the original estimates.

---

## A New Regional Committee.

It is gratifying to be able to report that a new Regional Advisory Committee is now being set up. The area concerned is Merseyside, South-west Lancashire and West Cheshire, to extend, it is hoped, from Chester in the south to Preston in the north.

A meeting of representatives from the local authorities in the area, who had received the memorandum on the subject sent out by the Society in December last, was convened by the Liverpool Corporation, and took place on April 10th.

In the absence through ill-health of Alderman Muirhead, Alderman Burns, deputy chairman of the Liverpool Health Committee, presided. Seventeen authorities were represented, and the meeting was addressed by Dr. W. M. Frazer, Medical Officer for Liverpool, Alderman Will Melland, the Chairman, and Mr. Arnold Marsh, the Secretary, of the National Smoke Abatement Society. The desirability of forming a committee in this important industrial area was stressed, and the constitutions and activities of the other regional committees were explained and commented upon.

Following the addresses a resolution was put to the meeting and carried without dissent. The principal section of this ran as follows: "That this meeting, consisting of representatives of Local Authorities in

the Merseyside and West Lancashire area, resolves that an Executive Committee, consisting of seventeen members, be appointed with a view to the formation of a Regional Smoke Abatement Committee under Section 10 of the Public Health (Smoke Abatement) Act, 1926; and that such committee constitute themselves the Regional Smoke Abatement Committee of the area."

A further resolution elected Dr. W. M. Frazer as the Hon. Secretary of the Committee.

A constitution will be drawn up by the Executive Committee and will at a later date be placed before the local authorities concerned for adoption.

With respect to the other areas suggested as suitable for the formation of similar Regional Committees in the Society's recent memorandum on the subject, there has been a promising amount of interest shown in the Tyneside district, and, in spite of difficulties that have been experienced in the past, the Society still hopes that some action may soon be taken. There has been a disappointing response from North Lancashire and the Tees-side areas, while from the group of local authorities constituting the Potteries there has not yet been any reply, nor any kind of indication that the proposals have been considered.



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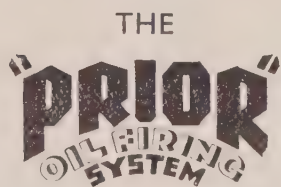
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*The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgements are made.*

## COMMENTARY.

THE observant reader will have already noticed that a new device appears at the top of this page. It is the newly chosen emblem of the Society, and, as will be seen, is a profile silhouette of John Evelyn, with the motto, "Fumus Fugetur," from which he obtained his coined word "Fumifugium." For some time past it had been felt that there would be value in having a suitable emblem—a kind of trade mark—and an appropriate motto. It was difficult to hit upon the right thing, as to portray smoke was simply negative and undesirable, and on the positive side sunlight is used by other bodies and even for commercial products, while the portrayal of clean air presents very obvious difficulties. But the proposal to utilize the head of the great pioneer of smoke abatement is not merely a way of honouring his work but provides the Society

with an emblem both distinctive and dignified. "Fumus Fugetur!"—let smoke be dispelled—was Evelyn's urgent plea as to-day it is our own.

Mention of Evelyn leads to the report that the publication of his "Fumifugium" by the Society has been most successful. Over 2,000 copies of the paper edition and nearly 200 of the cloth-bound have been sold at the time of writing, while the Press comments and reviews have been both numerous and appreciative. Nearly seventy cuttings on "Fumifugium" have been received. Strangely enough most of the copies have been sold outside the membership of the Society. There are several hundred members who have not yet purchased one. They are missing something of unique interest.



The importance and influence of the National Council of Women needs no elaboration. It is the locus of all the splendid work that is being done by women, and affiliated to it are not only all the women's associations, but also the national bodies whose work is the concern of women. It is therefore fitting that the national society which is concerned with the abatement of smoke—a problem which can largely be solved by women and to the benefit of all women—should link up with this organization. Application has been made, and granted, for the Society to become affiliated. As a result of this representatives will be appointed to two of the Sectional Committees of the N.C.W.—the Household Service and Public Health—which will enable the smoke abatement viewpoint to be put forward whenever matters which concern us are under consideration.

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Members and delegates are requested to note the date of the Annual Conference at Sheffield in September—22nd to 24th—and, if they possibly can, to be present. The Conference, the fifth of the new Society, will be of especial interest as it is being held in the area, and by the invitation of, the only statutory smoke abatement committee in the country. Sooner or later further committees will be formed in other parts to carry out the administration of the law relating to smoke emission, and the Sheffield, Rotherham, and District Committee will then be recognized as a pioneer and guide in this most important aspect of smoke abatement. The detailed programme will be circulated shortly, and will include a paper on organization for the solution of the domestic smoke problem; a paper by Councillor W. Asbury, chairman of the Sheffield, Rotherham, and District Committee on problems arising from the expiration of the five years exemption clause in the 1926 Act; and a further paper on psychological aspects of the smoke nuisance. A visit is being arranged, and there will also be opportunity for seeing the beautiful—and comparatively smokeless—hill country that surrounds Sheffield.

Mr. Randolph A. Glen, who has for many years been a member of the Council, has consented to become Standing Counsel to the Society. Mr. Glen's name is widely known in local government and legal circles as the author of a number of standard works on legislative question, and it is a great honour that he should associate himself with the smoke abatement movement in this way. The most useful and comprehensive short work on smoke abatement legislation has been Mr. Joseph Hurst's pamphlet "The English Law Relating to the Emission of Smoke." This has been rendered out-of-date by the passing of the 1926 Act, and Mr. Glen has kindly undertaken to prepare a new pamphlet on similar lines. There will be a wide demand for this work, which should be invaluable to town clerks, medical officers, and sanitary and smoke inspectors. It is hoped that it will be possible to publish this in the autumn.

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The next issue of the *Journal* will contain a full report of the summer meeting of the Society, with the paper on the effects of smoke upon buildings by Sir Frank Baines, and the contribution to the discussion by Mr. R. J. Schaffer. Sir Frank Baines is an architect who is well known as a late Director of Works, H.M. Office of Works, and whose paper on a similar subject at the Smoke Abatement Conference in Manchester in 1924 is one of the most valuable contributions to smoke abatement literature ever published. Sir Frank's estimate that smoke cost his Department, in the repair of Government buildings, a sum of £120,000 a year, is a statistic that, because of the authority behind it, has been very widely used. Mr. Schaffer is a member of the Building Research section of the Department of Scientific and Industrial Research and author of "The Weathering of Natural Building Stones." This work, which was reviewed in the *Journal* last year, is a full account of all the influences which affect natural building stones. Of these, it is hardly necessary to say, smoke is found to be one of the most pernicious.



## High Temperature Coke.

An interesting symposium and discussion on domestic fuels prepared by high temperature carbonization took place at an informal meeting of the Institute of Fuel on May 19th. The discussion was opened by Messrs. R. A. Mott, H. Hollings, John Roberts, and R. E. Gibson. Dr. E. W. Smith was in the chair.

The meeting was of an informal character and no full report of the proceedings are available. Many representatives of the gas and coke-oven industries were present, and the opinions expressed and outlook generally shown were very gratifying from the point of view of the smoke abatement movement. If the general attitude of those present can be summed up in a sentence, it was that a great potential demand for easily-ignited, free-burning, clean, and dry fuels is recognised, and that these could be prepared by high-temperature processes, either in gas retorts or coke ovens. The high quality of fuel obtainable by low temperature processes was not questioned, and the discussion was confined to high temperature possibilities only.

From the smoke abatement viewpoint in general, and from the viewpoint of the National Smoke Abatement Society in particular, it does not matter how a solid smokeless fuel is prepared so long as its qualities ensure satisfaction and an increasing use. Although fuels of excellent quality made by low temperature carbonization have been on the market for some time, it does not seem probable that the supply can, in the near future, satisfy the demand that is rapidly growing.

It is therefore important that domestic fuels should be prepared by any and every process which is capable of being adapted to produce such fuels. Success has been attained, for example in the fuel "Dryco," from gas retorts, as was demonstrated by Mr. R. E. Gibson of the Liverpool Gas Company. Successful fuels are also being prepared in coke-ovens, of which the one called "Glowite" is an example.

Such fuels seek to reach a level of quality equal to the best type of low temperature fuel, and possess certain advantages over the many grades of non-blended, high temperature coke, excellent though these are, that are being prepared and readily sold in many parts of the country. The chief differences between what may be called the good cokes and the better cokes, lie in their ease of ignition, their freeness of burning, and ability to "pick-up" from a low fire. It is attention to these important differences which will change a limited to a wider and ever-increasing popularity—always assuming, of course, that the important factor of price is favourable.

Poor quality, high ash, water-quenched cokes cannot, generally, be recommended for domestic purposes. The better quality cokes, generally prepared in vertical

retorts, can be recommended and are already widely used both in closed stoves and open fires. To ignite them, however, requires either a gas poker or the assistance of a few pieces of coal. There is thus an added labour or difficulty which, while it is nothing to the smoke abatement enthusiast, is an adverse factor as far as the ordinary householder is concerned. Further, a coke that takes a long time to revive a fire that has been allowed to die down soon becomes an object of criticism. The injunction "replenish frequently" is in itself another adverse factor. And while it is desirable that the most efficient types of grate, capable of burning almost any kind of coke, should be encouraged and used more and more extensively, it has to be realized that in millions of homes this cannot be afforded or that mere indifference will be an equally effective obstacle. Much can and is being done for smoke abatement with cokes to which these drawbacks apply; but far, far more can and should be done with both the low temperature and the "super" high temperature fuels. The open coal fire is unfortunately so deep a custom among the people of this country that it is logical to maintain that the easiest and quickest way of voluntarily abolishing it is by providing a fuel that will give every advantage, and none of the disadvantages, now given by coal.

### A Common Name for "Super" Cokes.

Mr. R. E. Gibson concluded his remarks at the Institute of Fuel meeting by making a most valuable suggestion. He proposed that a specification for cokes should be drawn up, and that those reaching or exceeding a certain standard of quality should be entitled to use a specific name. Later, in the course of his Presidential Address at the Annual Meeting of the Institution of Gas Engineers, Mr. Gibson said:—

"By suitable selection and blending of coals, by dry cooling and grading to suitable size, and by taking care to maintain a uniform quality, an excellent fuel can be obtained on the gasworks. It is inadvisable to call such special fuel "gas coke." A name should be given it which would guarantee its uniformity and excellence of quality. Ease of ignition is an important matter, since many people will not go to the trouble and expense of having special grates installed and fitted with gas burners. If the fuel is to be generally acceptable, it must be capable of being easily ignited and successfully burnt in any ordinary grate."

The adoption of such a proposal would, we venture to suggest, be of great assistance in popularizing the use of coke. The word "coke" possesses, at least in the minds of the general public, a suggestion of cheapness and inferiority; a view formed when the only coke available was in fact both cheap and inferior. The writer



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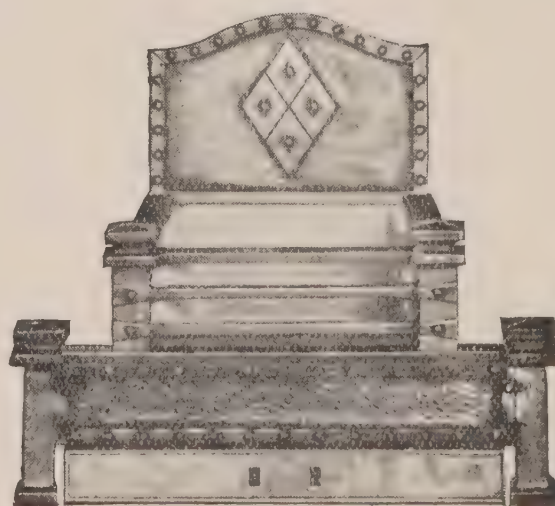
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some years ago inspected a housing estate where the "Cookanheat" range had been fitted in every house. In many cases coke was being used with satisfactory results, as it was meant to be. In others, however, bituminous coal was the only fuel used; the householders having a strong, even though irrational, prejudice against what they called "cinders."

When such an attitude exists, as undoubtedly it does in many parts of the country, the value of a distinctive name for all coke above a certain standard is at once apparent. Every salesman knows the value of the trade name: soap is merely soap, but "Pear's" is something more. Among smokeless fuels alone "Coalite" owes a great deal to the excellence of its name, and "Phurnod" is similarly more definite and distinctive than "cleaned, blended, and graded Welsh smokeless coal."

The adoption of a special name would also serve to stimulate carbonization undertakings which have not hitherto given much attention to the quality of

their coke from the domestic viewpoint, to seek to improve its quality so that it might pass the necessary tests and be sold under the new name. As the name became more widely known the fuel would be recommended and asked for throughout the country; demand would be followed by supply, and the standard of coke in every area would be improved.

There are great possibilities both in this particular suggestion and in the more general question of co-ordinating and developing the carbonized fuel industries, and it is sincerely hoped that the matter will be given early and serious attention by the associations which are qualified to consider and take action upon it. The National Smoke Abatement Society, of course, holds no brief for any particular type of smokeless medium—or rather it holds a brief for every medium that is smokeless—but it is felt that particular emphasis must be laid upon this question because of the enormous advance in smoke abatement that can be made in fields that have hitherto been comparatively untouched.

"Atmospheric pollution is one of the greatest evils that menace our national health. Smokeless households and clean factories run on scientific lines mean clean, healthy towns, free from smoke and the diseases it induces."

—Prince George, May 8th, 1933.

## Conferences and Meetings.

During the last two months a number of meetings and conferences on smoke abatement have been held. Space will not permit full reports being printed, but summaries of the principal points raised are given below.

### Scottish Branch.

The Annual Meeting of the Scottish Branch of the National Smoke Abatement Society was held in Edinburgh, on June 9th, and was opened by the Lord Provost of Edinburgh, W. J. Thomson. The Lord Provost declared that the city was making an honest effort to rid itself of the appellation of "Auld Reekie" and to live up to the more appropriate designation of "Modern Athens." In the annual report, which was submitted and approved, it was stated that the household chimney was responsible for the greater portion of air pollution. As the housewives, generally speaking, had control

of the household fire, the question of smoke prevention became largely a woman's question. The ladies could do much to combat the use of raw coal in the household. The preference for a raw coal fire was merely sentimental, as an equal, if not greater, amount of heat could be obtained by the use of smokeless methods, with equal, if not greater, efficiency.

"Pointers for Smoke Abatement" was the subject of a paper read by Professor William Oliver, Professor of the Organization of Industry and Commerce at Edinburgh University. He said that the Utopian aim of complete smoke abatement was very far from attainment. The problem of domestic smoke diminution depended primarily upon the use of a smokeless fuel such as coke, plus an increasing sale of gas and electricity for domestic heating and cooking. This conclusion, in turn, led one to the belief that the ideal system



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would be one in which all our raw coal would be treated by a low temperature carbonization process, the gas so obtained being used for gas supplied and for boiler firing, while the oil, tar, and other by-products would be used to reduce our imports of these commodities, the coke itself being used for domestic purposes. The work being done on the problem of low temperature carbonization led one to the conclusion that in time practically all difficulties would be overcome. Smoke pollution would then be a thing of the past and our descendants would no doubt look back upon our times with surprise and contempt as a veritable "murky past."

Bailie Mrs. Somerville, Edinburgh, in the course of a further paper, quoted statistics to prove that since 1923 to date there had been very little appreciable effect tending towards a reduction in the death rate of children from respiratory diseases. She said that she was sure that no one would dare to answer in the negative the question of "Can the infant death-rate be further reduced by concentration on the abatement of smoke?" While during the last twenty-five years there had been a marked reduction in the death-rate from diseases of the digestive system, there had not been to anything like the same extent a reduction of the death-rate from diseases of the respiratory system.

#### **Manchester and District Regional Smoke Abatement Committee.**

At a recent meeting of the above Committee Mr. A. E. Crossley, F.S.I.A., senior smoke inspector in the Manchester Public Health Department, gave an address on "The Smoke Problem from the Sanitary Inspector's Point of View." Mr. Crossley referred to the vast improvement he had seen in the atmospheric conditions of some of our towns during the past thirty years, although the improvement had not been as great as one would desire.

Great progress, he said, had been made by both chemist and engineer, particularly during the last 15 years. The scientific application by the engineer of the principles formulated in the laboratory had revolutionized steam production; and the recognition by steam users that smoke abatement is fuel economy had played a very important part in the results so far obtained. But whatever the type of plant or equipment we must realize that the human element is still the predominant factor, and in spite of all the most modern plant and equipment it is quite hopeless to expect satisfactory results unless the man responsible for its operation has a thorough grasp of the principles of its operations.

Mr. Crossley deplored the lack of uniformity in the campaign against smoke. The periods of inspection, the qualifications of inspectors, and the liberties allowed varied, he said, from one district to another.

Alderman W. T. Jackson, who presided, said of the new Manchester Central Library: "What a beautiful building of white Portland stone this is. It stands out of the black, smoky buildings in Manchester, and yet I venture to say that in two years it will be as black as this Town Hall. You will not know whether it is built of Portland stone or bricks, or any other material."

Mr. A. Bradshaw, of Manchester, gave the meeting examples to show that the incentive of economy was likely to be a powerful one in the fight for smoke abatement. After being advised, one firm had pulled down its coal bill by £82 a week (though the output had been increased by 30 per cent.). Manchester Royal Infirmary had been able to cut down its coal consumption by 540 tons a year.

#### **Royal Institute of Public Health.**

Alderman Will Melland, Chairman of the Society, read a paper on smoke abatement at the Congress of the Royal Institute of Public Health at Eastbourne on June 1st.

Alderman Melland said, in the course of his address: "It does seem strange, when we remember the many laws that safeguard the purity of our water, food, and milk, that the necessary legislation for the purification of our atmosphere has not been placed on the statute book long ago. The explanation of this is probably the fact that people are and always have been entirely apathetic about smoke and it is well-known that a Government cannot legislate very far in advance of public opinion. "An instance of our callous acceptance of the smoke nuisance was the tragedy that occurred in the Valley of the Meuse in December, 1931, when 60 persons died after only a few hours of intense suffering in consequence of the sulphurous fumes imprisoned in a thick fog which persisted for three days.

"While in Belgium this occurrence roused such general alarm and consternation we in England are quite accustomed to this sort of thing; for in a town the number of deaths after a heavy fog invariably rises and numbers of persons, especially those suffering from respiratory diseases, are killed off. But for years we have been so accustomed to this quite unnecessary slaughter that we accept it as something normal and carry on with out business of smoke production.

"Smoke has no boundaries and we suffer for the sins of our neighbours as well as our own. Smoke is carried by the wind all over the kingdom; the sheep on the high moors of beautiful Derbyshire are blackened by it, and snow lying on the top of Snowdon bears traces of it."

#### **National Council of Women.**

In the course of an address to the Household Service Section of the National Council of Women, in London



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on May 18th, Mr. Arnold Marsh, Secretary of the Society said: "The coal fire wastes three-quarters of its expensive heat and creates the smoke nuisance which is the principal cause of the perpetual hard labour to which the British housewife is sentenced. Smoke from industrial chimneys is now being overcome, but it is true to say that the housewife herself is mainly responsible for the dirt which disgraces homes and towns, for the health-destroying acids and tar in the air, and for the deplorable sun-starvation of children.

"St. Paul, if he lived in Britain to-day would have to change his remark to 'I am a citizen of no clean city.' The domestic coal fire is a relic of the really dark ages and belongs to the dusty past as much as the what-not and the horsehair sofa.

"The average family makes and deposits upon its neighbours more than its own weight of smoke each year. When the wind is easterly the sheep in the Isle of Man are blackened by smoke drifting from Lancashire.

Mr. Marsh added that at the present time the abolition of domestic smoke by the prohibition of the coal fire was admittedly not in the range of practical politics, but developments in the production of smokeless fuels and the cheapening of gas and electricity might very quickly make the reform possible. It would be one of the greatest moves for bringing health, light, and beauty to our island."

#### **Institution of Gas Engineers.**

Smoke abatement was referred to several times at the annual meetings, at the beginning of June, of the Institution of Gas Engineers in Liverpool. Mr. R. E. Gibson, of the Liverpool Gas Company and the new President of the Institution, paid a tribute to the Society during the course of his Presidential Address, when he said: "Largely owing to the efforts of the National Smoke Abatement Society public opinion is gradually being developed in favour of the use of smokeless fuels. We should take advantage of this and the subject

calls for the prompt and united action of the gas industry."

Professor E. W. Marchant, President of the Institution of Electrical Engineers, in an address at the conference, said that he hoped that electrical and gas engineers might join forces in regard to a reduction in the smoke nuisance. Statistics showed that if we could reduce the amount of permissible smoke in the large towns we might do as much in reducing mortality as if we altogether abolished tuberculosis, which accounted for something like 1,000 per million of the population.

Mr. F. P. Tarratt, president-elect of the Institution of Gas Engineers, said we still had smoke although trade was bad, and it was largely due to domestic consumption of coal. That was proved by the smoke-pall over our towns on Sundays at mid-day and tea-time.

#### **Royal Sanitary Institute.**

Lord Cozens-Hardy, in his address as president of the Royal Sanitary Institute Congress at Blackpool on June 19th, said that modern hygiene had shown that a polluted air supply was no more desirable than a polluted water supply, and it was possible that a partial solution of that problem would depend on the purifying of the air of the industrial towns of the north-west. Legislation, so far, had devoted itself to curbing the output of the factory chimney, but in the average industrial town during the winter months the bulk of the air pollution came from the domestic fire-place. Until a smokeless fuel for domestic use, whether it be low temperature fuel, gas, or electricity, were universally adopted it would be useless to rely upon regulations that only affected factory chimneys.

He realized that the objection to the adoption of smokeless fuel was economic, but he suggested that the municipalities which owned gas and electricity undertakings might make a real contribution to the health of the industrial areas if they would provide the public with cheaper smokeless heating, and take active steps to popularize it.

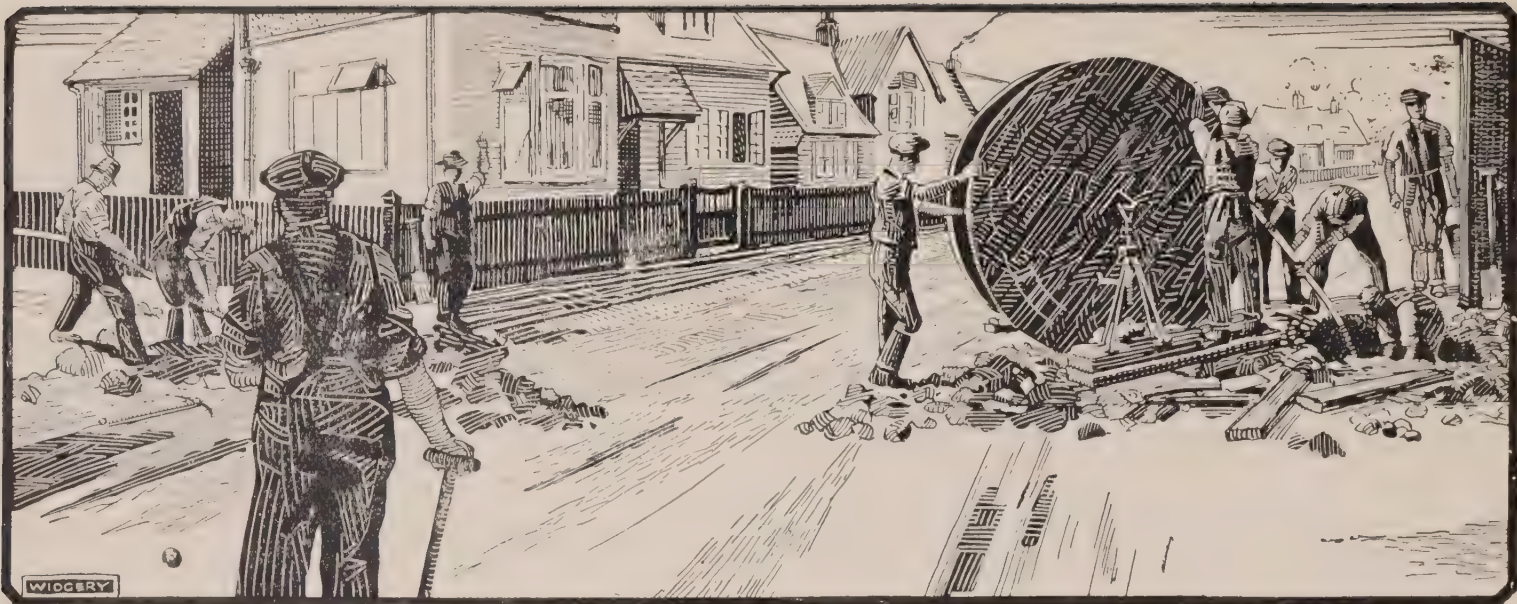
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#### **Medical Officer and Tuberculosis.**

At the annual meeting of the Leeds Association for the care of Consumptives Dr. G. S. Johnston, tuberculosis officer to the West Riding County Council, said that within the space of the last twenty-five years the death rate from pulmonary tuberculosis in the West Riding had been reduced by almost half. There were still a few influences working against them. The smoke-laden atmosphere in the cities was, he was sure, responsible for a great many deaths during the winter months.

A further death from carbon monoxide poisoning is reported from Aylesbury. The victim was found in his car in a garage, where he had been for twenty-four hours. The engine of the car had been running until the petrol gave out. He was then still alive and was taken to a hospital, where he died later. Carbon monoxide was found to be present in the blood from the heart and the brain, and death was due to bronchial pneumonia and odema of the lungs as the result of carbon monoxide poisoning. At the inquest an open verdict was returned as there was insufficient evidence to show how the deceased came to be in the position in which he was found.





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## **ELECTRICITY IS THE ENEMY OF SMOKE**



## Another New Regional Committee

Following the meeting of Local Authorities in Liverpool, as reported in the last issue of the *Journal*, to form an Advisory Regional Smoke Abatement Committee for Merseyside and South-west Lancashire, a similar conference has taken place in Newcastle-upon-Tyne. This conference, convened by the Newcastle Public Health Committee, has also been successful, and it has been agreed to form an Advisory Regional Committee for Northumberland and Durham.

The meeting was held in the Town Hall, Newcastle, on May 26th, and was attended by about sixty representatives from neighbouring local authorities. Alderman David Adams, J.P., Chairman of the Newcastle Health Committee, and a member of the Executive Committee of the National Smoke Abatement Society, presided. The delegates were welcomed by the Lord Mayor (Dr. J. W. Leech).

The meeting was addressed by Alderman Adams, Mr. Arnold Marsh, Secretary of the N.S.A.S., and Dr.

J. T. Dunn, president-elect of the Society of Chemical Industry. The meeting was then thrown open for discussion, which centred upon actual problems confronting local authorities in the area rather than upon details of the formation of the committee. It was agreed, unanimously, that an Advisory Regional Committee be formed, and that an executive committee of 27 members be set up. The Authorities so far represented upon the Committee are as follows: Durham and Northumberland County Councils; Boroughs of Gateshead, Newcastle, South Shields, and Sunderland; Municipal Boroughs of Blyth and Jarrow; Urban Districts of Billingham, Blaydon, Earsdon, Felling, Gosforth, Houghton-le-Spring, Longbenton, Seghill, Washington, Willington; and the Rural Districts of Houghton-le-Spring, Sunderland, and Chester-le-Street.

The Chairman announced that Dr. J. A. Charles, Medical Officer of Health for Newcastle, has consented to accept the position of hon. secretary.

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## The Elimination of Dust and Sulphur from Boiler Flue Gases.

*Abstract from a Paper by H. E. Wallsom, B.Sc., presented to the Members of the Institute of Fuel and of the Society of Chemical Industry at Bristol in February, 1933.*

### Introduction.

Quite recently the House of Lords has ruled that a power station can commit a nuisance by the emission of sulphur fumes, and the erection, by the London Power Co., Ltd., of the Battersea Power Station is conditional upon precautions being taken for the "due consumption of smoke," and for preventing as far as reasonably practicable, the evolution of oxides of sulphur.

It is seldom, however, that a case comes into court to restrain a nuisance caused by chimney emissions, as public opinion is usually, and rightly so, on the side of the plaintiff; nevertheless, public authorities are faced with the expense of disbursements to meet the claims of neighbours whose property is suffering damage from dust and sulphur fumes.

The centralization of electricity undertakings, within the last six or eight years, and the advent of high-pressure, high-rated boilers has not been so much responsible for these troubles as that the concentrated

effect has become, or could become, a nuisance. It is generally recognised that, with stoker-fed installations, 15 to 20 per cent. of the total ash in the coal passes to the stack, whilst with pulverised fuel, the amount is increased from 75 to 80 per cent. In addition, some residual combustible matter is always present in the ash.

The province of this paper does not include any discussion of the essential conditions that constitute a nuisance, but it must be obvious that, if a Power Station, burning 1,000 tons of coal per day, is allowed to deposit 150 tons of ash per day within a small radius, a serious problem has to be dealt with.

As the result of the assiduous efforts of a large number of investigators, it may now be stated that the elimination of dust from flue gas is theoretically possible to a gratifying extent, and there now remains the problem of the translation of theory into practice. To describe how far this has been accomplished is one purpose of this paper.



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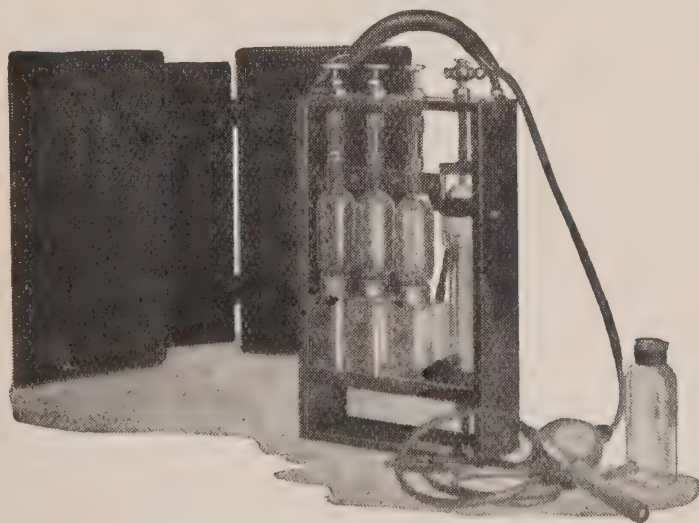
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### Available Methods.

General methods which are available for minimizing the flue dust problem, other than by the use of collecting apparatus, are as follows :—

(a) *By pre-treatment of the coal.* This can be accomplished by a large number of cleaning processes, and it is safe to say that by this means the average ash content of coal burnt in power stations could be reduced from the present 15 per cent. to probably less than 6 or 7 per cent. It is well established that no material saving would accrue to the coal consumer by this means, at least in the capital costs, or in the purchase of coal on its thermal value basis, but a reduction of maintenance costs would be assured. Dr. Lessing stated that the shale constituents of coal, on account of their high fusion temperature, passed more easily to the stack than does the inherent ash of the coal, which, by its basic nature, is more readily fusible, and thus forms aggregates in the combustion chamber. These, by reason of their weight, cannot be maintained in suspension in the gases.

At the same time, the pyrites may be almost entirely eliminated from coal by cleaning, and the sulphur content reduced by as much as 80 per cent.

Attempts have been made to fix the sulphur in the ash by the addition of lime to the raw coal. The experiments were unsuccessful for obvious reasons: the ash from boiler furnaces seldom retains more than a trace of sulphur; there would be a still greater quantity of ash, which would be more easily fluxed by the lime, and in usual circumstances, the average coal ash contains basic oxides in sufficient quantities to enter into combination with the sulphur in the coal.

(b) *By suitable design of chimneys.* Professor Travers in a paper on this same subject considers that much good might result from a correct design of chimney mouth.

On the Continent and in the United States of America where the average degree of humidity of the atmosphere is much less than in England, it has been found that in many cases the sulphur, and, to a lesser extent, the dust problem, may often be overcome if the height of the chimneys is sufficient. If flue gases, at temperatures of up to about 150°F. in excess of that of the atmosphere, are discharged at a sufficient elevation, the effect of the eddy currents in the lower air will be modified, the sulphur fumes will be perfectly diffused, and the dust will settle over so wide a radius that its effect would not be appreciable.

(c) *By suitable design of boilers.* It has been widely stated that dust emissions from boilers fired by pulverized fuel have been so serious that the further development of this system has been seriously retarded on that account. Experience has shown that with corner firing, as practised in the Combustion Steam Generator, a turbulence is produced in the combustion

chamber, and this is the effect which, in a cyclone collector, causes the heavier dust particles to settle in the ash pit. The cyclone effect is further augmented by the fusion of ash particles in the central zone of intense heat, and aggregates of particles are thus formed.

### Dust Collecting Systems.

Dust collecting systems are of three main types :—

- (a) Electrical precipitators.
- (b) Centrifugal collectors.
- (c) Washing apparatus.

Any statement of the "efficiency" of a dust collecting system should only be made with the utmost discretion. Dust is defined by Prof. W. E. Gibbs as material of a particle size in excess of 10 microns (1 micron equals .001 mm.) and at present there exists no method of ascertaining the relative proportions of material above and below this mesh size which are in suspension in flue gases. The purchaser of apparatus would prefer an efficiency figure based on the ash content of the raw coal, and such figures can only be obtained by careful ash balance tests of long duration, made with certain well defined considerations. Any test carried out on previously collected dust can only be indicative of the capabilities of the apparatus, but it is only on the results of such tests that many manufacturers tend to base their guaranteed efficiency figures.

(a) *Electrical precipitators.* Electrical precipitation was first applied practicably by Sir Oliver Lodge, whose work was subsequently duplicated collaterally by Cottrell in America and Moeller in Germany. The principles of electrical precipitation, as applied by Lodge-Cottrell Ltd., and the continental and American companies in association with them, is that the dust-laden gas is made to pass through pipes or between plates, which act as the collector electrodes, and which are earthed. Suspended in the centre of the pipes, or between the plates, is a series of discharge electrodes, consisting of wires or rods, with discharge points, and which are maintained at a high positive potential of 60/70,000 volts. A brush discharge takes place, and the wires can be seen to glow, and are surrounded with a corona.

The solid particles become ionized, and thus move toward the positive or collector electrodes, where they give up their charge, and thus fall by gravity into hoppers, or if they tend to adhere to the electrodes, these are rapped by automatic hammers to cause the accumulated dust to fall.

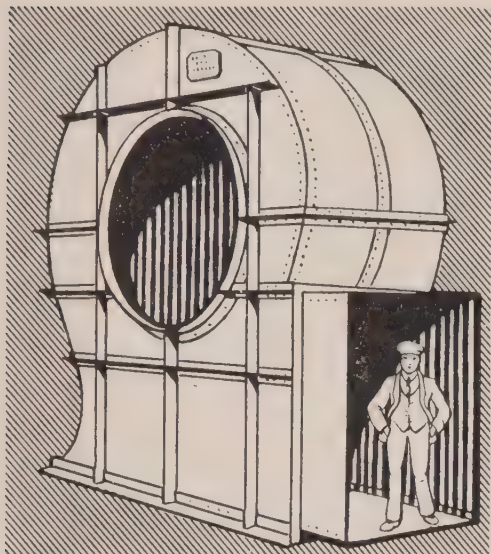
Electro-filters are usually installed on the suction side of the induced draught fans, and thus the serious problem of erosion of the fan blades by the dust particles does not arise. The dust is recovered in a dry condition, and in selected instances a ready market has been found for this material in several industries.

It is undeniable that, if the velocity of the gas passing through electro-filters is reduced to about 6-ft. per



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second, this type of apparatus is, by itself, the most efficient in the elimination of dust from flue gas. Electro-filters have, however, their inherent disadvantages, which are enumerated :—

(i) A decreasing efficiency with increasing load, that is, an increasing dust concentration. This is particularly noticeable during soot-blowing periods.

(ii) They are unable to retain sulphur compounds in the gas, unless these are present as sulphur trioxide.

(iii) The initial cost of electro-filters is very great, being as much as 25 per cent. of the cost of the boilers, or 4 per cent. of the cost of the whole Power Station. In addition the space which they occupy is very considerable, the electro-filter apparatus being of much the same dimensions as the boiler, the flue gas of which it treats.

(iv) Unless a market is available for the dust, the cost of disposing of this, on account of its very finely divided condition, is somewhat excessive.

It is not an exaggeration to say that with an electro-filter, efficiently operated, there is not visible emission from the stack. An efficiency of dust extraction of 94 to 98 per cent. is possible with this type of apparatus, but 90.5 per cent. may be considered as an average figure.

(b) *Centrifugal precipitators.* Basically, the principle of this type of apparatus is that the dust-laden gases have imparted to them a rotary motion, generally by admitting them tangentially into a cylindrical chamber. The gases are forced out to the periphery of the collector by a mushroom plate, or if tangential injection is not used, the same vortex action is produced by vanes fixed in the annular space between the mushroom plate and the shell of the collector.

(c) *Dust removal by washing.* Any discussion of the washing of flue gases should rightly be dealt with under two separate headings, the elimination of dust, and the elimination of sulphur. Since the removal of sulphur is to be further mentioned, the dust will be first considered.

At its inception, the washing of flue gas was attempted by means of sprays situated in a chimney. The gases thus had to pass contra-flow to a curtain of finely divided water particles, and whilst the results were, to some degree, satisfactory in preventing the wholesale dissemination of dust, it was found that the high velocity of the gases resulted in the carrying upwards in the chimney of the smallest water and dust particles. These were then deposited in the form of a muddy rain in the immediate neighbourhood of the Power Station. Some of this wetted dust would also adhere to the inside of the chimney, and periodically aggregations of this material would drop back.

Further developments were made by the use of staggered vertical rows of hollow baffles, down which water flowed, placed in the path of the gases. This

is the principle of the Modave washer. Messrs. Underfeed Stoker Co., Ltd., have developed a two-stage washing process in which the primary stage consists of atomizing sprays, followed by sprays produced by the impinging of jets of water against flat plates, and a secondary stage of rows of staggered V-shaped baffles down which a constant supply of water is flowed.

The principal difficulty inherent to the operation of all flue-gas washing systems is the disposal of dust slurry produced. This problem has been solved very satisfactorily by Messrs. Mining and Industrial Equipment Ltd., with a process of thickening and filtering the slurry.

### The Sulphur Problem.

Methods available for the removal of sulphur compounds from flue gases are :—

1. Washing by water.
2. Washing with a solution or suspension of alkaline material.
3. The reduction of sulphur compounds to the element sulphur.
4. The oxidation of sulphur compounds, to sulphuric acid, for example.
5. By the interaction of the sulphur compounds with an alkaline gas, and recovery of the compound formed by water washing.

1. *Water Washing.* At the outset it appeared that the incidental recovery of sulphur compounds is the principal disadvantage of all flue gas washing systems, particularly when the water has to be recirculated. Circumstances have compelled the author to make a study of this problem, in order to be able best to deal with the acid corrosion resulting. Unless the sulphur compounds emitted from the chimney will definitely cause a nuisance, it is the aim of washing systems to collect only the minimum possible amount of these.

In connection with the erection of the Battersea Power Station, much investigation on the treatment of sulphur fumes has been carried out by the London Power Co., Ltd., and their advisers, the results of which are published in the Ministry of Transport White Papers, Nos. 3442 and 3714, 1929 and 1930. In the very complete investigations carried out, gas was passed through a vertical cylindrical absorption tower, contraflow to a current of water, entering the chamber through a series of nozzle sprays. The tower was packed at times, with spiral absorption rings, and in a further series of tests the possible catalytic effect of iron was eliminated by coating with cement the iron parts of the tower, and using pottery absorption rings.

Summarized briefly, the results obtained show that :

1. The amount of cold water necessary to bring about the solution of approximately 90 per cent. of the sulphur compounds in the gases was about 30 tons per ton of coal burnt, the amount varying slightly according to, but not proportionately to, the sulphur content of the coal.
2. A contact time of at least 7 seconds is necessary to attain the 90 per cent. efficiency.



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3. The amount of wash water required is considerably decreased by the use of water heated to 145°F.

4. Iron has a definite catalytic effect.

2. *Neutralization of the Sulphur Dioxide.* The use of alkaline solution to neutralize acid gases is well known, but in the case of flue gases the cost of chemicals would preclude the general adoption of this method. It has been shown, in connection with the experimental work carried out for the Battersea Power Station, that the use of sodium carbonate greatly increased the efficiency of the elimination of sulphur and necessitated a much smaller quantity of water, the time of contact remaining constant. The Committee, presided over by the Government Chemist, which reported upon this experimental work, state that soda ash would not, however, be used on account of its excessive cost, and that milk of lime would be substituted.

Whenever alkali is to be used, the recovery of the product of the reaction is an impossibility, on account of its dilution and its association with other salts, and the total cost of the alkali must be debited against the process.

3. *Reduction to Elemental Sulphur.* If sulphur dioxide could be reduced catalytically to free sulphur, and this material could be recoverable as a by-product, the problem of acid corrosion would cease to exist. The obvious difficulties of carrying out this reducing action are numerous, the greatest being that the amount of oxygen in the flue gases would militate directly against the process.

4. *Oxidation of Sulphur.* It has now been definitely established that the capacity of water for absorbing sulphur dioxide may be greatly increased by ensuring its contact with the dissolved oxygen from the flue gases, in conjunction with catalysts. The use of catalysts in this particular reaction is well established, and processes for the use of copper sulphate, and salts of manganese, iron, and tin are patented.

### Conclusions.

The available information may be summarized as follows :—

1. The choice of plant must be governed by :—

(a) *Location of plant.* The location of the Power Station in the centre of a populated area will necessitate a closer study of the problem than if it were situated in a country district.

(b) *Characteristics of the coal.* The emission of dust and sulphur fumes may be minimized by the choice of suitable coals.

(c) *Disposal of Refuse.* There is only a very limited market for the products obtained, and the disposal of the ash and water from wet systems present their own problems. It seems to the author that, in pulverized fuel installations, the recovered dust might be usefully returned to the furnace, and there fused. Where this is carried out a very hard, dense, granite-like material has been obtained, for which a good market is open.

(d) *The degree of dust concentration.* For larger dust particles centrifugal separators would probably be satisfactory, but with fine dust either electric precipitators or washing systems are to be recommended.

(e) *Availability of water supplies.* Other things being equal, the facility with which large quantities of water may be obtained, and disposed of, must probably be the deciding factor in the choice of electric or wet process.

### 2. Present Standard of Progress.

It may be safely asserted that, theoretically, the problems of the nuisance caused by the emission of flue dust and sulphur fumes have been solved, and that further developments will improve the efficiency of operation of known principles.

### 3. General Observations :—

(a) Considering their comparatively low initial cost, wet systems will give the highest degree of commercial efficiency.

(b) Centrifugal collectors, whilst they definitely alleviate the trouble, are not so efficient as other systems.

(c) With electrical and wet systems it is desirable that the velocity of the flue gases should be reduced to 6-ft. per second, to ensure the retention of the finer dust particles.

(d) In wet systems, especially where re-circulation is necessary, the use of unprotected steel-work is undesirable, on account of acid corrosion, and it may be advisable to increase the gas velocity through the system in order that this trouble should be minimized.

(e) The velocity of gases in the stack should be sufficiently great to prevent the collection of wetted dust from washing systems at the top of the stack, or its deposition on the Power Station roofs.

(f) Where wet washing is favoured the use of lead lining for washing chambers and stacks is preferable rather than concrete, as this material is liable to rapid deterioration by acid action. The use of wooden washing chambers may possibly overcome many difficulties in this direction.

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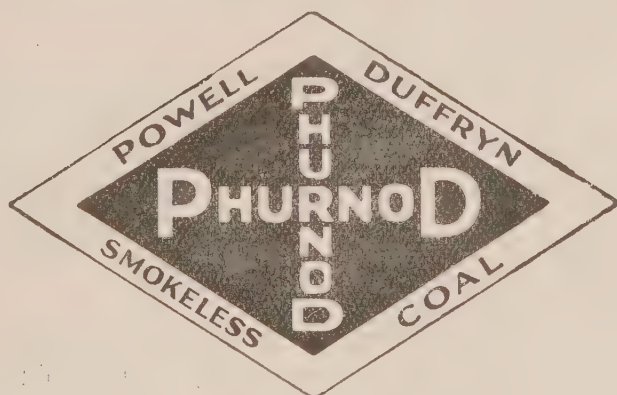
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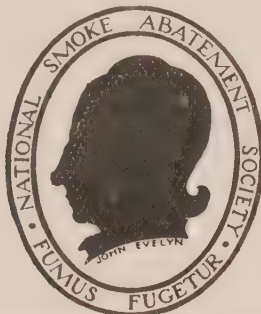
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*The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgements are made.*

## COMMENTARY.

THE deputation of representatives of the London chimney sweeps who recently urged that, as the source of their livelihood was disappearing, they should be given the opportunity of entering the gas industry, is perhaps nothing more than a portent, but it cannot be denied that it was a very impressive portent. The abolition of smoke means, necessarily, the end of the chimney sweeping profession, and an organized appeal from the sweeps is a visible sign of progress. Most reforms injure some vested interest, if one can use that harsh term to such an ancient and honourable calling, but few will shed tears when this link with the past is gone. There is still something sentimental about the sweep, either because of Charles Kingsley or because of their characteristic gollywog appearance, with the curious brushes and white eyes gleaming from the blackened face. But

such jobs have no place in the modern world ; the sweep, if he does not mind us saying so, is an anachronism as much as the hansom cab. But sweeps are first of all individuals, and it would indeed be fitting if, as they suggest, they could transfer their allegiance from the defeated to the victors, and themselves take part in laying the pipes and connecting the wires that are causing their unemployment. They have our especial sympathy because the National Smoke Abatement Society will in time, and for the same reasons, follow them and will also be without work to do. Some day the last Conference will be held in the clean air of a white town, and someone will rise to move the winding-up resolution. "Golden lads and lasses must, like chimney sweepers, come to dust." Unfortunately the adjective cannot be applied to us, or we would be able to come to a successful dust much earlier than we anticipate.



Speaking seriously, though, we wish the chimney sweeps had more work to do. There is still plenty for them in the thousands of chimneys that are deliberately and regularly fired. This is the most obnoxious and unnecessary of smoke nuisances, and the small fines that are levied upon a few of the offenders at the police courts seem to make little difference. Much, however, could be done by marshalling local public opinion and by municipal action to stop this disgusting practice. We commend its consideration to all our readers who are connected with local authorities.

Elsewhere in this issue appears a descriptive account of the Conference, and the two resolutions that were passed are also recorded. The full papers and discussions will not appear in the *Journal*, but are to be published separately, as last year, in book form as the *Proceedings of the Sheffield Conference*. This will shortly be obtainable from the Society's offices at a price of 1/-, post-free. The three papers, or if we include the President's most informative address, four papers, range widely over the smoke problem, and each constitutes a valuable addition to our literature. In turn the papers examine atmospheric pollution as it actually exists, review the legislative position it has created, consider the future organization and action it necessitates, and make a powerful plea, from the point of view of the individual, for its abolition. The Conference, newspaper frolics apart, was one of the most pleasant and enjoyable of all. It has not yet been arranged, but it is hoped that the 1934 conference will be held in Glasgow. The Scottish Branch, and the many keen members who regularly attend the meetings in England, are ample guarantee of the success of that gathering.

Our own meeting in London, in June, 1932, when smoke and fumes nuisances from road vehicles was discussed, was, we thought, excellently reported and discussed in the Press. But it created nothing like the stir which followed the paper by Sir W. I. de C. Wheeler at the Dublin meeting of the British Medical Association. The widespread publicity given to his statements must have been, for the purposes of making the public

realize the seriousness of the question, a most salutary event. We hope that they may at least reduce the number of press cuttings we receive relating to inquests on people found dead from asphyxiation in closed garages.

A new and rather remarkable possibility respecting carbon monoxide poisoning is indicated as a result of recent experiments. It is generally known that a sudden ascent to a great height is accompanied by serious breathing difficulties, dizziness, and general weakness. This is the last great obstacle in the way of Mount Everest and similar climbs, and is met with in other instances. The reason is that the quantity of oxygen at such rarefied heights becomes so small that the red corpuscles of the blood cannot obtain the requisite quantity to carry round the body. In time, however, acclimatization takes place, breathing and bodily action becomes normal: the blood-forming organs have been so stimulated by shortage of oxygen that they produce an excessive number of red corpuscles and haemoglobin, so that the blood enriched in this way can supply the oxygen requirements of the body. Recent experiments on carbon monoxide inhalation have shown that the effects of the gas are less marked with people who are frequent occupants of motor cars, and it is suggested that this is due to a similar acclimatizing effect. The body is deprived of oxygen owing to the combination of haemoglobin in the blood with carbon monoxide in preference to oxygen, and this is the cause of death if there is sufficient monoxide. With smaller quantities of the gas, however, the blood-forming organs may be stimulated, as in rarefied air, in order to obtain more oxygen, and the body may thus become acclimatized. Whether this action, if it is correct, actually reduces the danger from carbon monoxide is a very doubtful point. The struggle to supply oxygen may, while achieving its immediate object, lead to secondary or indirect ill-effects; and the sudden introduction of a non-acclimatized person into conditions that usage may have made unnoticed to others, may be attended by serious consequences. The danger is too grave and too sudden for reliance upon anything but a complete absence of the deadly gas.



# The Effects of Atmospheric Pollution

*The Paper by Sir Frank Baines, K.C.V.O., G.B.E., F.R.I.B.A.*

The summer meeting of the Society in London was held this year on July 14th, and was the occasion of an important paper by Sir Frank Baines, the full title of which was "An Examination into the Effects of Atmospheric Pollution on Buildings, etc., with a Preliminary Summary of the Conditions Disclosed by Various Inquiries into the Condition of the Atmosphere over Great Britain." It was proposed at the Annual General Meeting in Sheffield in September that Sir Frank be invited to be a Vice-President of the Society, and it is with pleasure that we are able to state that he has kindly honoured the Society by accepting this invitation.

The paper is being printed in full in pamphlet form, and the following is a summary of the matter contained therein.

## General Considerations.

In November, 1924, said Sir Frank, he had the honour to address the Smoke Abatement Conference held in Manchester, when his subject was confined to the effects of atmospheric impurities on buildings. Since that time detailed knowledge of atmospheric pollution had certainly advanced, but the problem remained much as it was; there was little direct evidence that the intolerable nuisance causing the destruction notably of our historic buildings, was in any way materially diminished.

Progress would, he thought, mainly be registered in the early stages of an attack upon a serious problem such as this, by promoting a progressive interest in its various aspects in relation to national welfare generally, by an increase of scientific inquiry, by the promotion of legislation, and by engaging the interest of municipal bodies and private persons.

It was only within a comparatively recent period that restrictive and practical legislation had been acknowledged to be, not only desirable, but absolutely necessary. That was undoubtedly an advance, because it meant that there was now a definite urge to ascertain what progress would be made towards a solution by imposing restrictions based on scientific knowledge: particularly was this so in a country whose industrial output was the foundation of national prosperity. To-day those who claimed with too complete an assurance that the problem was insoluble, that atmospheric pollution was an industrial necessity, and that it was an ineradicable concomitant of efficient production, were moderating their views: cost was made up of factors not alone rising from *laissez-faire* economics. The contention in the past had been that coal, being the cheapest source of heat and power, both for industry and the householder, must continue to be used without restrictions affecting

the economic equation. Political economy, however, now recognised that the health and well-being of the people and the amenity of their lives, were becoming more than ever an economic necessity in the evolution of progressive industrial state.

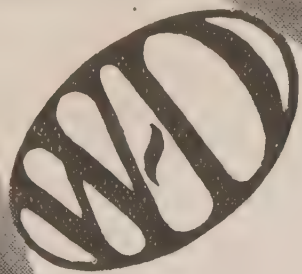
Sir Frank Baines then considered parliamentary action and discussed the 1926 Act. Legislation was tentatively reaching out in an endeavour to deal with what was felt to be the controllable factors of smoke emission from raw coal consumption in factories, power stations, and large industrial units, but was not prepared to deal with the critical problem of the domestic fire or the very destructive sulphur gases. Local and municipal bodies, however, were unmistakably aroused, as shown, for example, by their attitude towards the National Smoke Abatement Society, the work of the Regional smoke abatement committees, and their action in the Fulham Generating Station inquiry.

## Sulphur Fumes.

His investigations into the action of sulphur acids from power stations dated from 1924 as a result of a strong complaint from a lessee of Government property who stated that within recent years the emission of noxious fumes and gases from the Marylebone and Grove Road Power Stations had greatly increased, and who gave evidence of his garden being destroyed, his conifers being killed, and his rose trees practically ruined. In spite of funds not being available for a thorough investigation he was satisfied that the trouble was primarily due to the fumes from the power stations. Recent inquiries had shown that the distribution of sulphur is detrimental to the country as a whole, and not only to the industrial area immediately concerned. Sulphur activity recorded by the lead peroxide "candle" at Rievaulx, an ideal pastoral valley in Yorkshire, showed that while the atmosphere is much purer than in industrial areas, its contamination is still about one-twentieth of the average pollution of London.

The complaint previously mentioned had been raised again in 1926 and in his late capacity as Director of Works he had submitted a proposal that restrictions should be imposed on Power Stations to provide for steps being taken to wash sulphur out of flue gases, in spite of the alleged prohibitive cost. Prior to this suggestion, which was now recognised as a reasonably practical proposal, the Government had agreed to the erection of the Battersea Power Station, and it was interesting to record that local opposition was so strong that it was decided eventually to instal only one-third of the agreed plant, the remaining two-thirds to be sanctioned only when it had been demonstrated that the flue gas washing plant was capable of removing





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effectively smoke and grit, and reducing the quantity of sulphur emitted until it might be regarded as negligible.

Sir Frank gave in some detail the conditions laid down at the Fulham inquiry, mainly because he thought it should be a precedent for future action: if our municipal authorities have taken fully into account their powers and responsibilities, the future held every prospect of a material amelioration of existing conditions.

#### Notable Investigations.

The paper reviewed the admirable investigations undertaken by Dr. Des Voeux, Dr. Owens, Professor Cohen, and Dr. Simpson, and dealt with the valuable work now being undertaken by the Department of Scientific and Industrial Research. He suggested that the Society could do useful and practical work in bringing the broad facts of the D.S.I.R. Reports in some convenient form before the public, together with an instructive commentary.

#### Coal Statistics.

The latest available figures of coal consumption had been obtained, which showed that between 1927 and 1932 there had been a reduction in the consumption of coal of roughly 30 millions tons per annum. It was also shown, taking the increase of population into account, that the consumption of fuel per head of population had apparently decreased by 14 cwts., from 81 cwts. in 1927 to 67 cwts. in 1932. The annual consumption of coal for domestic fires might well prove to be as high as  $1\frac{1}{2}$  tons per annum. Consumption in specified areas was not fully known, but calculations showed that the use of coal in London would be:

Domestic	..	12,300,000 tons.
Industrial	..	12,000,000

Total .. .. 24,300,000 tons per annum.

It would be seen how important the domestic fire is as regards pollution; and no complete solution of the problem could be anticipated if the domestic fire was excluded.

Sir Frank then considered at some length the extent of atmospheric pollution together with estimates of the total impurities in the air and the extent of deposits. He considered in particular the measurement of sulphur compounds and the drift of pollution from the cities over the countryside.

Dealing with the effects of smoke upon health he concluded his observations by saying that the country was clearly becoming alive to the matter. It was far more vital in respect to the welfare of the people than was the heavy loss due to the effect of atmospheric pollution upon buildings and important national monuments. It was to be hoped that some authoritative body would attempt to collate statistics, now that particulars of the Meuse tragedy were known, as regards the probable deleterious influence of fog and atmospheric

pollution upon the health of the nation. It should not be beyond the wit of science to devise a scheme by which a programme of investigation could be outlined.

#### The Effects of Pollution upon Buildings.

It was impossible for him to feel that there had been, in the few years since he last addressed the Society, the slightest perceivable improvement in the unrelenting attack which was delivered unceasingly hour by hour upon our buildings of all classes and character. He referred to a specific example in the War Memorial at Sandon, five miles to the north-west of Stafford. Six years after its erection it was found to be rapidly deteriorating, although no apparent contributory cause could be detected. The statue was a bronze figure upon a stone pedestal on which were carved inscriptions. The stone was Portland of a fine grained Whitbed, and superficially appeared to have been selected from the very best beds; yet in spite of this decay was visible on all four faces, and particularly noticeable on the north-west and south sides. The stone was blistered, with definite eruptions and burst surfaces which had left irregular shaped holes. The erosion and breaking away of the stone continued round the lettering, and yet when it was chemically examined no unusual constituent which would account for the deterioration was found.

Another interesting instance occurred in 1924 when it was complained that the Nurse Cavell Memorial was left in a discoloured and dirty condition. The statue had been cleaned by an expert staff four times per annum since its erection, and on inspection Sir Frank came to the conclusion that the dingy yellow colour would spread slowly over the marblework; and that it was due to atmospheric impurity. The cleanings were increased to six per annum, but it was seen that special measures would have to be taken. The question was referred to the Government chemist and it was found that the persistent yellow stain was due to the oxidization of sulphide of iron naturally occurring in the marble. Veins of sulphide of iron hardly noticeable to the eye were found to be generally distributed through the mass of the marble; and these had weathered more than the calcite grains of the marble. On examining a piece of the original marble it was found that the discoloration was due to atmospheric pollution.

He had previously estimated that the cost of making good the results of atmospheric impurity to our buildings for the whole of the country could be placed at a minimum figure of 55 to 60 million pounds during the last quarter of a century. Since making that estimate he had been able to look into the figures further, with the result that he was convinced that the actual damage, if carefully calculated from all sources, would probably be found to be far in excess of this.

Considerations of finance were more than ever important to the nation to-day, and this unprofitable



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expenditure must be known not only to the Government but to municipalities, industry, commerce, and property owners generally; and although their attention is drawn to the cause with almost tireless iteration, there must be an immense inertia in public opinion which permitted such conditions to continue. Consistent propaganda, however, for the final elimination of the deleterious products causing the nuisance must finally produce some material measure of abatement.

The composition of stones and the action of atmospheric pollution upon them was described. Since the 17th century the principal building stone in London had been Portland; the principal ingredient of which was crystalline calcium carbonate. So rapid was the decay of such stones in the country, that the very best picked Portland stone shows a destruction of well over  $\frac{1}{8}$ th inch in 14 years. Even York stone, which had long been regarded by architects as a stone of great durability, showed, in the polluted atmosphere of London, very striking evidence of decay. Bath stone was peculiarly subject to attack, and on certain London buildings ornament of Bath stone, some inches in thickness, could be broken off by the hand like pieces of shortcake. Red Mansfield stone as used in part at the Houses of Parliament had been removed more than once since its erection. Even the best Westmoreland slates, which used to be regarded by architects as the best "metal" for roofing, and as an almost permanent material, had been so attacked by atmospheric pollution that the finger could be driven clean through them without any material resistance.

### The Houses of Parliament.

Sir Frank Baines' extended inquiry into the condition of the Houses of Parliament showed that sulphate was present—which could only have been derived from the attack on the stone by atmospheric acid—in cracks and fissures twenty inches from the surface, with the result that the crystallization of magnesium sulphate occurring at such depths in the stone, with the huge increase of volume of from 1 to 4.2, had thrown off great pieces of stone to such an extent that even in a short and rapid summary inquiry into the case, over 35 tons of such pieces of stone were picked off portions of the building by hand without touch of tool or hammer, while some pieces lifted by crystallization were over two tons in weight.

The main cause of the condition of the building was definitely atmospheric impurity, although it was rendered vastly more serious owing to primary faults in the stone. The stone contained numerous sealed-up cleavages due to earth movement and disturbances of strata while still in the quarry bed. These, filled up with calcitic matter were hardly discernable, and where they occurred horizontally they were not so serious. Where,

however, they were found in buttresses, piers, mullions, pinnacles, turrets, and in the various ornate and finely cut decorative features of the stonework, such as the semi-crowns of the west front of the building, these cleavage planes, through the action of sulphur acids in the atmosphere, opened and rendered large masses of stonework perilously insecure and likely to crash down on to the streets and courts below. This indeed had frequently happened in the past, and was one of the principal reasons for the complete examination.

Although this exceptional defect—without parallel in any other building known to him—was the primary cause of the costly work of restoration—the normal effects of atmospheric attack were present throughout the building.

Many methods of preserving stone and affording resistance to attack had been examined and tried, but the final result had been a record of unalleviated failure. Some of the so-called preservatives, in addition to being quite ineffective, appeared definitely to prejudice the future life of the material. The washing of stonework by acid was undoubtedly the one practice that could be followed with safety.

### Possible Solutions.

Sir Frank concluded his paper by discussing the possible solutions to the problem, both domestic and industrial. After considering the various methods possible, he mentioned that they had recently erected two large buildings, the maximum accommodation of which would run from five to seven thousand, in which not a single domestic flue was provided. Yet in four Government offices in Whitehall there were over 800 flues being used for heating by the normal means of the open grate. Was it too much to suggest that in great accommodation buildings utilized by Government, Municipal authorities, and large Corporations, every attempt should be made to eliminate the domestic fire?

Pulverised and colloidal fuel were mentioned and criticized, and the necessity of washing flue gases of sulphur and other products was stressed. Summing up, Sir Frank said that he thought the Society should continue to press for legislation applied to the large coal consumer, the small, coal fire being left to be dealt with later, when the householder could be offered a form of heating which was actually generated without offence to community in general. When electricity stations and gasworks were clean sources of energy, we might feel—if he were to venture a prophecy—that the community would not hesitate to force the small user to get rid of his polluting plant or thoroughly attend to it, whether it was open fire or boiler. We should concentrate, then, upon the purification of the flue gases from the large consumer.

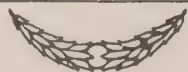


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# Impressions of the Conference

By "Spectator."

These smoke abatement conferences have grown considerably since I first attended them, but they still seem to retain that rather friendly, informal character that makes all the difference to one's recollections. Perhaps it is because most of the members stay at the same hotel and are able to talk before breakfast and to gossip until midnight.

Sheffield was sunny and warm on the Friday afternoon when we arrived, but it was quite plain, even to those of us who had never been in the city before, that what has been said about the smoke was probably no exaggeration. Chimneys are everywhere, and even if they were not then emitting smoke they all looked capable of doing so on the slightest provocation.

The Conference opened with a civic welcome—a reception by the Lord Mayor, Alderman Ernest Wilson, in the Town Hall. It was carefully explained to those of us who did not know it, that the Town Hall was the old municipal building and therefore black, whereas the City Hall, in which our subsequent meetings were to be held, was new and therefore still white. But neither time then nor space now permits the drawing of the moral that must be there. The number at the reception did not seem as large as on previous occasions, and most of those present were our own people. There were certainly no serried ranks of steel-makers to greet us. For entertainment we were shown, in the form of a male quartette, an example of the choral music for which Sheffield is so well-known. It was, perhaps, a pity that there was no preliminary warning of the first song, which, commencing fortissimo, startled an unsuspecting company into a respectful silence that lasted the whole evening.

There was the customary short speech of thanks to our hosts by Dr. Des Voeux, and a response by Alderman Wilson. So felicitous was everything that we all understood what was meant, and almost approved, when the Lord Mayor hinted that Sheffield would like to see more smoke. He, with the Lady Mayoress and the Society's officers, were placed in a dignified row and photographed according to an old custom of the Sheffield newspapers in photographing rows of people on every possible occasion.

Next morning saw us punctually assembled in the Memorial Hall of the dazzling and beautifully proportioned City Hall, dutifully approving reports and accounts (how relieved Mr. Marsh looked when it was agreed to take the Annual Report as read!) and re-electing officers and committees. The Annual Report showed us how varied was the work of the Society and how valuable, from a long distance view, are some of the apparently minor activities. The statement of Accounts with, for the first time, a Balance Sheet, was evidence of Alderman Melland's careful chancellor-

ship of the exchequer. I understand that he was personally responsible for the £100 winding-up donation of the Manchester and Salford Sanitary Association, and hope that he may be successful in persuading other bodies to wind up with such beneficial effects.

Dr. Des Voeux, whose valuable address was worthy of a long discussion instead of no discussion at all, and which was not even read, apparently because of time shortage, was as modest as usual and tried hard to escape from the hall when the election of President was reached on the agenda. He does not seem to understand how much we admire both him and the long years of effort that he has given to smoke abatement.

Bailie Brownhill Smith was chairman to Mr. Councillor Asbury at the Conference session, following the Annual Meeting, and it would be remarkable if he was not a little proud of the position, for he was one of the two or three who, at a conference in Sheffield in 1909, started the Smoke Abatement League of Great Britain. Councillor Asbury, as a member of the Sheffield City Council and Chairman of the statutory Committee, had a difficult and diplomatic task in giving a paper on the famous (or notorious) Five-Year clause, but he did it with courage and success. Good as his paper was, Mr. Asbury's reply to the discussion, which was naturally extempore, was even better, and it made clear how much of the success of that solitary committee was due to its chairman. There might be more statutory committees if there were more Asburys.

The discussion on the paper was good, even though it was marked by the usual fault that crops up at every conference—a disposition on the part of some members to look upon smoke abatement as a single subject and to assume that it is proper to discuss any aspect of it instead of confining themselves to the particular questions raised by the paper. It is a symptom of amateurism, and was unfortunately even more prevalent on the Sunday morning. The question of advisory versus statutory committees was raised, as now seems inevitable, by the ardent protagonists of the former methods, but the most informative contributions to the discussion were from Sheffield delegates connected with, or interested in, the steel industry.

It was a good morning's work, broken only by a tour round the building for a further photograph upon the steps of the main entrance for the edification of the readers of Sheffield's evening paper.

There is no siesta time at these conferences, and immediately after lunch departure was made from the Grand Hotel, in motor buses, to the Smithy Wood coke-oven plant. It was a dull, rainy afternoon, and, forgetting the benefits of instruction, one could not





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help remembering the idyllic afternoon at the Newcastle conference, in the bracing air and warm sunshine of the wide moors at Borcovicus.

There is little resemblance to Roman walls in Becker coke ovens, and a 2,500 ton coal bunker can never, even as a two thousand year old ruin, look the same of a legion's granary.

Split up into small parties, each in charge of a member of the staff, the making of oven coke and the treatment of the gases and distillates was followed with interest and appreciation by all. The unfortunate smoke emission that follows the charging of the retorts was observed more in sorrow than in anger, for the difficulty of the problem was at once apparent. Tea, after such an energetic tour, became a longed-for ending to the visit, and it was kindly provided by our hosts, the Newton Chambers company. Mr. Greenfield replied to the thanks expressed for us by the President, and told us what remained for us to know. But even then we had not learned enough for the day, and on coming back into Sheffield we were taken to the University where, in the fuel research department, Mr. R. A. Mott showed and explained some of the open fires that are being experimented upon, and in which oven coke is being tested.

The rigours of the day had their effect upon that peculiar informal meeting that is always scheduled for Saturday evening. On this occasion people gathered round in convivial circles, and as far as could be ascertained, informally discussed anything but smoke. There was simply no energy left for business.

Everyone, however, was wide awake on Sunday morning, and if they were not Mrs. Jast soon stirred them into keen attention. Seldom do we have the chance of listening to so moving a plea for pure air and so unanswerable an indictment of dirt and gloom and the cruel, Sisyphean labour of the British housewife. The conference was as electrified as the grid, and

everyone realized, some perhaps for the first time, that the cleansing of the air was a crusade as well as a question of politico-technology. Nobody blamed the President for speaking so feelingly those straight words that so excited the papers next day, although they may have grudged him his position on the platform that gave him the opportunity. I wonder what the papers would have said if, because of our momentary fierce zeal, we had sallied forth and razed to the ground a few of the more obnoxious chimneys in the neighbourhood?

The matter of the joint paper by Mr. Clayton and Mr. Gandy may have seemed a little pedestrian after Mrs. Jast's noble flights, but this paper too, was a welcome change: it looked forward and not back, urged construction instead of reviewing obstruction, and stated, in terms that had been carefully considered much that was of real value to the movement. The proposal for local or district organizations to deal with the development of smokeless methods, especially domestic, should be considered by every municipal authority.

Dr. Rennie, Sheffield's Medical Officer, had a strenuous task in marshalling the discussion, and it is a pity that most of what was said did nothing to develop the ideas in the two papers. It is especially trying to hear speeches that have been heard before. But on the whole it was an interesting discussion, and altogether an exhilarating morning to conclude the conference.

Except for a motor tour to Bakewell in the afternoon, in which about a score of unwearying members took part, it was the end. All I would suggest to make the Conference really worth while, is that everyone who was present does try to put into effect the good intentions that inevitably occurred to him or her during the week-end. The next conference should begin where this one left off, and should not start all over again. Repetition is the fault of many conferences, and the fault is with those who come to confer.

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## A Letter to the Editors

Sir: Medical views on the amount of sunshine this country has experienced in the past summer appear to negative the claims of enthusiasts and salesmen who constantly assert that an essential to the improvement of national health is the extended use of so-called smokeless fuels so that we may feel the sun's effects as much as possible. During the heat wave medical men often published warnings against too great exposure to the sun, and within the last few days a well-known doctor was reported as saying that if he were called on to prescribe for the national health and could control the weather he would order a dark period as we had been having too much sun.

People value their domestic fires for reasons of health and comfort within doors and it looks as if they should also see in their chimneys a safeguard against debility from too much sunshine.

Thos. Walker.

This letter has not been sent to the *Journal*, but to the local newspapers of Lancashire and Cheshire, two or three of which have published it. Mr. Thos. Walker is a frequent writer to these papers, and the burden of his letters is to show that the coal fire is blameless and that any kind of smokeless medium is a source of danger. The letters are, of course, just coal propaganda, and the example printed above is perhaps the most bewildering and extraordinary of all Mr. Walker's arguments. It is uncertain whether he means that the sun is always dangerous, or whether it is only dangerous during a heat wave. The latter may be granted to him; but to keep cool and prevent sunstroke by means of a coal fire in every grate seems to be, to say the least, a most curious method.



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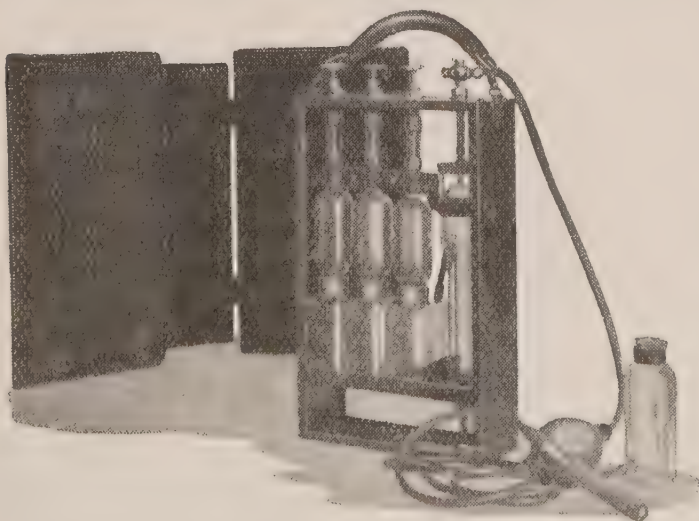
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# Smoke Abatement Committees

## The West Riding Regional Committee.

The Annual Report of the above Committee for the year 1932-33 states that the chief activities during the period have been to survey the present position with regard to the working of the 1926 Act in the area, and to revise the syllabus and regulations in connection with the training and examination of stokers.

To determine the present position with regard to the Act, a questionnaire was sent out to the 90 constituent authorities in the area, the replies to which showed that 64 authorities possess a byelaw under Section 2 of the Act, out of which number 25 have a prescribed time allowance for the emission of black smoke of two minutes in the aggregate in the half hour, and 39 a three minutes allowance.

Although only nine authorities—six with a three minute and three with a two minute time allowance—state that they have experienced difficulty in administering the byelaw, and only three with a two minutes allowance state that local manufacturers have difficulty in keeping within the prescribed limit, no less than 24 authorities with a three minutes allowance were of the opinion that the time was not yet opportune to reduce the limit to two minutes.

As the Minister of Health, after the Bradford inquiry in 1928, had suggested that after a trial period, which might be three years, he would be prepared to entertain applications for a two-minute allowance, a special sub-committee recommended "the Regional Committee to invite the authorities having the three minutes allowance to state whether they were now prepared to consider a reduction to two minutes."

Of the 39 authorities to whom such a communication was sent, 7 indicated that they were prepared to approach the Minister of Health, while 13 authorities still maintained that a higher standard than three minutes in the half hour cannot, at the present time, be justified.

The Committee has also considered the questions of smoke emissions from fair-ground engines and from fried-fish shops. With regard to the former a recommendation is made:

"That the Regional Committee urge those authorities having control and letting of lands on which pleasure fairs are held to insist on a clause in the conditions of tenancy requiring the use of coke, anthracite, or other smokeless fuels."

## The Sheffield, Rotherham, and District Committee.

The third Annual Report of the solitary statutory committee is a record of extensive activities. From the statistical reports it is seen that 7,004 chimneys were observed during the year, with an average smoke emission of 3.3 minutes per hour. 85 notices and 382

intimations were served, while no less than 870 advisory visits were made. Only nine prosecutions were instituted. The Report deals fully with the measurement of atmospheric pollution in the area, and in addition to the collection and analysis of deposit, both ultra-violet radiation measurements and the measurement of active sulphur dioxide are carried out.

It is reported that the research work of the Joint Advisory Committee has come to an end, and that all that is required is "the appointment of someone by the University to hold a watching brief on behalf of the Committee, who would visit works, inspect plant, and carry out certain limited experimental work, but with no definite programme."

The Committee has discussed with the University authorities the question of instruction classes for stokers, and a syllabus drafted by a sub-committee has been forwarded to the University for their consideration.

Extracts from the report of the Chief Smoke Inspector are as follows:—

As will be seen by the statistical tables, the amount of observation work was increased and though the total smoke emissions were also increased, the average emission per observations remained about the same. It is hoped that these averages will be reduced to less than two minutes per hour, but a considerable amount of re-construction and instructional work will be necessary before that objective is reached.

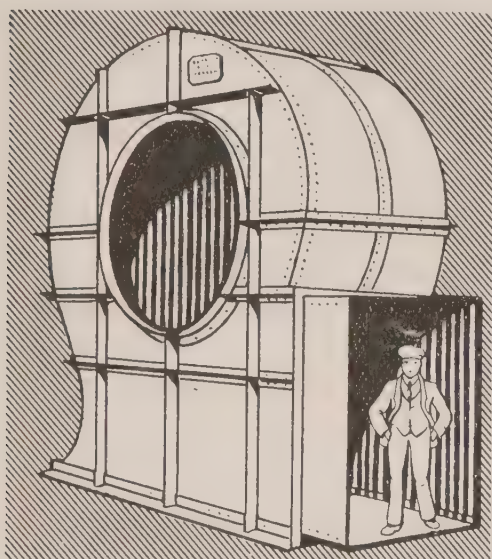
With regard to re-construction, this is a matter which cannot be controlled by the department, and is one in which the assistance and co-operation of the manufacturers is most necessary. It is not a question of spending with the object of eliminating smoke, but more essentially of wise spending for efficiency and reduced fuel costs.

The commonest cause in this district (of boiler smoke) is that of forcing the boilers beyond their working capacity. Boiler plants should be installed so that "peak" loads can be carried without forcing the fires. In the majority of cases the boiler plants are only capable of dealing with normal loads, so that during peak load conditions, forcing is resorted to and smoke nuisance is caused, as well as a considerable waste of fuel. Colliery boilers, users of low-grade fuel, cause offence in this respect. The management state that they are compelled to burn this fuel or put it on the "tip" where it is likely to cause more nuisance. Undoubtedly it is better to burn this fuel on the boilers, but adequate boiler provision should be made for this material. Time is an essential factor in the burning of low grade fuels, and if the plant is too small for maintaining steam supply, the time factor has to be reduced by forcing the fires.



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Dealing with metallurgical processes it is stated : During the year a number of furnaces have been reconstructed, some of them with modern controlled methods and mechanical stokers, and some fitted for gas firing. The manufacturers all state that they are well satisfied and that in many cases output is increased and fuel economy effected. Other furnaces have been re-constructed on the old handfired methods without any facilities for controlling either the fuel or air supplied. This is regrettable and shows a lack of foresight on the part of the manufacturer, who will in future regret not having installed a properly controlled plant.

One large sheet mill works have fitted most of their furnaces with a pre-heated supplementary controlled air supply, and from a pollution point of view have made a remarkable improvement, the furnaces working with a minimum of smoke. The management state that considerable fuel economy has resulted, and that the quality and output of the material have not suffered in any way. The tendency of this method will be to produce a quickly oxidizing atmosphere in the furnace, but as long as careful manipulation continue and the management are satisfied with the results obtained, the apparatus is good. It can be simply applied to any existing form of sheet-mill furnaces without heavy costs.

Mr. Law concludes his report by saying that "the old spirit of hostility against the Department is disappearing, and the feeling of confidence and co-operation is taking its place."

### Bengal Smoke Nuisances Commission.

The Committee whose reports are reviewed above are only in their infancy when compared with the Bengal Commission, which has now issued its 27th Annual Report. The admirable and successful policy of the Commission under the direction of Mr. R. Grant, Chief Inspector and Secretary, is shown by the practical nature of the Report and by the table showing how the average observed smoke emission has decreased from 13.1 minutes per hour in 1906 to 0.08 minutes in 1932. The opening paragraphs of the Report are of a striking character :

"The advance of knowledge on the subject of the evils of smoke nuisances and the corresponding improvement in the health of the people have been accompanied of late years by a growing general interest in the abatement of smoke nuisance. The developments of even the last 10 or 15 years afford striking object lessons of further advantages which are quite within reach, and which can be brought about with but little trouble and little outlay. In the general decline of sickness and mortality, which is a characteristic of Calcutta and suburbs during the last 15 years, the diminution of forms of respiratory disease attributable to impurity of the atmosphere, is among the most conspicuous.

"It is singular how much greater regard a man has for his stomach than for his lungs. He would resent the possibility of the introduction of unclean food three times a day into his stomach, but the introduction of unclean air sixteen times a minute into his lungs is submitted to without complaint."

The reasons for the 66 smoke offences reported during the year are interestingly classified as follows :

Insufficient draught .. ..	27
Neglect or careless firing .. ..	24
Unduly restricted draught .. ..	9
Insufficient furnaces at work ..	4
Defective flues .. ..	2

Methods and rules for hand-firing are given and form a useful summary for boiler attendants. Domestic smoke is also being considered, and although there is no legislative remedy available, as in this country, propaganda is being undertaken through the distribution of literature. Arrangements are also being made with cinema authorities to illustrate the evils and abatement of smoke upon the screen.

The central Smoke Observatory is situated at the top of a high building and immediate telephonic communication is made when smoke emissions are observed. Chimneys not visible from the offices are observed from the districts. It is stated that "the Commission like other modern Smoke Departments, is convinced on the long view, that a broad educational and co-operative policy in the skilled work of smoke abatement gives the best result."

**A Domestic Boiler Development.** A new domestic back boiler appears to possess qualities which render it much more efficient than the ordinary type. The principle feature of the boiler, known as the "Rad," are stout V-shaped corrugations on the surfaces, which both increase the available heating surface and prevent undue contact of the comparatively cold metal with incandescent fuel. The grooves or channels also

facilitate draught—a factor especially important with the use of some smokeless fuels. The boiler is of 3/16 in. rolled copper. Tests have shown that with this boiler water temperature is increased at a more rapid rate, and that the increase is still more rapid if the boiler is used in conjunction with the cylinder and circulatory system also devised by the same firm.



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## Conference Resolutions

The following Resolutions were moved and agreed to at the Annual Conference of the Society at Sheffield on Saturday, September 23rd. The first, on the Road Traffic Act, was proposed on behalf of the Scottish Branch, and the second, relating to smoke abatement and housing, on behalf of a Sub-committee of the Executive Committee.

### Road Vehicles.

*Resolved:* That the Ministry of Transport be respectfully requested to take the necessary steps to amend Regulation No. 18 of the Statutory Rules and Orders, made under the powers conferred upon him by the Road Traffic Act, 1930, by inserting after the word "fuel" occurring in the said Regulation, the words "shall use only smokeless or non-bituminous fuel and": Provided that for the purpose of this Regulation the words "smokeless or non-bituminous fuel" shall be held to mean "fuel containing not more than fourteen per cent. of volatile matter."

The Regulation referred to, if amended in the way proposed, would read: "Every motor vehicle using solid fuel shall use only smokeless or non-bituminous fuel and shall be fitted with a efficient appliance for the purpose of preventing the emission of sparks or grit, and also with a tray or shield to prevent the ashes and cinders from falling on to the road."

### Housing.

*Resolved:* That this Conference of the National

Smoke Abatement Society welcomes the extensive schemes that are to be undertaken for slum clearance and re-housing, and as smoke, with the dirt, gloom, and ill-health that it causes, is one of the most important factors in producing slum areas, urges all authorities concerned with housing to take steps to ensure the greatest practicable degree of smokelessness in all new housing estates, whether municipal or privately built, and rebuilt areas.

In particular it urges:

(a) That appliances for the use of gas and electricity should be installed as extensively as possible, and their use encouraged.

(b) That where ranges for cooking and heating and open fires for the use of solid fuel are installed, they should be of a type capable of satisfactorily burning smokeless solid fuels, for the storing of which adequate accommodation should be provided.

The Conference urges the Minister of Health to investigate the position with respect to (b) above, and to make recommendations to the authorities concerned according to his findings.

Further, with a view to ensuring a parallel reduction of smoke emission from buildings other than private dwelling houses, the Conference urges the Minister of Health to take steps which will make possible the framing of byelaws under Section 5 of the Public Health (Smoke Abatement) Act, 1926.

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## News and Reviews

### Sanitary Inspectors' Association.

At the Annual Conference of the above Association, held at Clacton-on-Sea in September, a paper on "Air Pollution" was read by Mr. J. W. Beaumont, Chief Sanitary Inspector, Halifax, who is a member of the Society's Executive Committee.

Mr. Beaumont's paper was principally devoted to reviewing the legislative position, the work of the Regional Smoke Abatement Committee, and the measurement of atmospheric pollution. It was, he thought, an indisputable fact, that in the matter of preventing atmospheric pollution less progress had been made than in any other branch of sanitary science. It was his firm opinion that an intensive and progressive propaganda campaign was the prime necessity of to-day. Such work properly undertaken must in time produce a

strong, well-informed, smoke-conscious public opinion which must be an accomplished fact before they could hope for the tightening up of legislation which would result in their emancipation from the smoke clouds which now darkened their skies. Mr. Beaumont referred to the work of the National Smoke Abatement Society, which for years had been a "voice crying in the wilderness." That was not, however, the position to-day. The Society's work was worthy of all the support they could give.

Following the discussion on this paper the following resolution was unanimously passed by the Conference:

"That this Conference is of the opinion that the two minutes limit for the emission of black smoke in any period of thirty minutes should be the maximum under any byelaw, and that this should be made to apply to the whole country at the earliest opportunity."



### Society of Chemical Industry.

Two papers of interest to the readers of this *Journal* were presented in connection with the Annual Conference of the Society of Chemical Industry in Newcastle-upon-Tyne in July. "The Occurrence of Lead, Copper, Zinc, and Arsenic Compounds in Atmospheric Dusts, and the Sources of these Impurities" is the title of a paper by Dr. J. T. Dunn and H. C. L. Bloxam. Dr. Dunn is the President for the year of the Society of Chemical Industry, and was Chairman of one session of the National Smoke Abatement Society's conference in Newcastle in 1932.

The other paper is of the greatest importance, and is concerned with "The Application to the Battersea Power Station of Researches into the Elimination of Noxious Constituents from Flue Gases, and the Treatment of the Resulting Effluents." The extensive and prolonged work at Battersea to devise means for eliminating sulphur gases and other impurities from flue gases is, in view of the peculiarly difficult problem created by the large super-power-station, a matter of national importance. Space will not allow a fuller consideration of this lengthy and detailed paper in this issue, but it is hoped that it will be possible to deal with it at a later date, together with an abstract of the previously mentioned paper by Dr. Dunn and Mr. Bloxam.

### Fuel Economy Review.

This annual publication, published by the Federation

of British Industries, is, as usual, a mine of information to those concerned with the technical aspects of smoke prevention and of fuel economy. Almost every article has some bearing upon the smoke problem, ranging from developments in low temperature carbonization, coke-oven technology, fuel control and economy in the iron and steel industry, gasworks practice and the industrial uses of town's gas and similar industrial questions to a valuable article by Mr. H. G. Clinch on "The Education of the Stoker."

In view of the fact that the whole outlook of the Review appears to be in accordance with our own point of view, although perhaps from a different angle, it is surprising to read in the Editorial the statement during the last few years "coal as the industrial source of energy has had to face attacks not only from other fuels on technical and economic grounds, but also from the activities of smoke abatement societies who often seem oblivious of the economic consequences of their propaganda."

As there is only one smoke abatement society in the country the paragraph appears to be directed to us, and we wish that our injurious activities had been mentioned more specifically. Apart from the health and amenity aspects, which secondarily may also be considered as economic questions, the whole of the smoke abatement case is based on economics: the economics, that is, of the national well-being. And it has long been recognised that it is useless to advocate new methods or fuels unless they are of economic value to both the producer and the consumer.

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We are informed that Prior Burners Ltd., of Crown Yard, Stanhope Street, London, N.W.1., have opened a service and sales depot for Prior Mastokers at 58, Cromwell Street, Glasgow, N.W., to handle their increasing Scottish business. The depot will be in the charge of Mr. R. Clifford Primrose, F.I.M.T., who has

represented the company in Glasgow for some time past. Inquiries regarding service and sales in Scotland should now be addressed to the Glasgow office, but technical details will continue to be dealt with in London.

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